# Consulting Engineer

November 1961

GERALD T. McCARTHY, president of the American Institute of Consulting Engineers and partner in Tippetts-Abbett-McCarthy-Stratton, Engineers and Architects, recalls being told as a student at Pennsylvania State that civil engineering was developing into "a matter of maintenance, since this nation already has railroads, highways, electricity, and modern cities."

Continued on page 10



Photo by Fahlan Bachrach



## 250,000 BBL. FUEL TANK SEALED BY HALLIBURTON GROUTING

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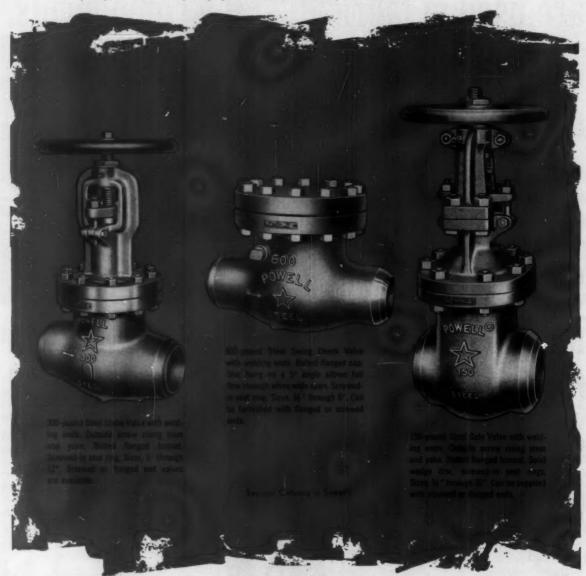
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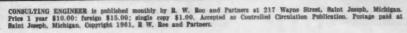
## For Engineers in Private Practice



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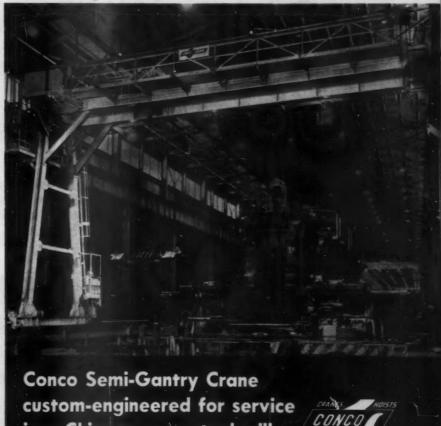
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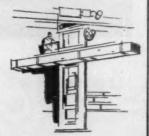
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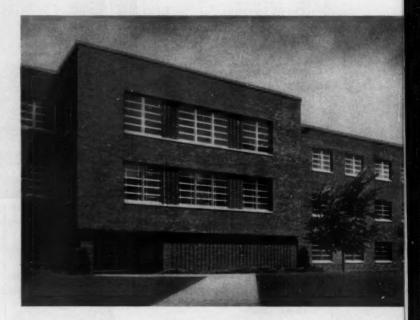
## How *Imaginative Engineering* Uses Pneumatic Temperature Control To Guarantee Year 'Round Patient Comfort

Scott & Kinney, Kansas City consulting engineers, took a new look at an old problem and designed a *different* heating and air conditioning system for the University of Kansas Psychiatry Building. Their unusual method features two separate fan systems and a unique automatic damper application that eliminates the noise and distribution problems usually encountered with ordinary single-fan systems.

Providing uniform year 'round temperature together with foolproof individual room control has always been a problem in designing buildings of this nature. But Scott & Kinney provided the solution in their selection and imaginative arrangement of a Powers Pneumatic Control System.

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Final check on the U. of K.
Psychiatry Building's pneumatic control system by the consulting engineers, Wilson O. Kinney (left) and Arthur R. Scott.

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This imaginative handling of standard Powers temperature control equipment is another example of problem-solving by the consulting engineer and the specialized help of Powers field engineers. The University of Kansas has reaped the benefits for the last four years — in comfort, operating economy and low cost maintenance.

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## GERALD T. McCARTHY

- Starts on front cover

McCarthy, whose firm has headquarters in New York City, and 20 offices employing approximately 500 persons throughout the world, still thinks his professor might have been mistaken.

## **International Work**

Throughout his career as a consulting engineer, McCarthy has had a strong interest in international projects. As a result, his firm has handled projects in 51 countries. Currently chairman of the Executive Committee of the U. S. Committee on Large Dams, McCarthy, with his firm, has taken part in many of this generation's most impressive water development projects. One of the more interesting ones began with the Indus Treaty Negotiations. From 1954 to 1960, TAMS was retained by the International Bank for Reconstruction and Development, to provide technical assistance for a treaty governing the waters of the Indus.

The Bank had been discussing the problems with India and Pakistan for two years before proposing a division of the waters. Pakistan questioned the adequacy of the plan, and a detailed hydrologic analysis became necessary.

Some of the problems on which TAMS worked were the irrigation requirements which a treaty plan should meet and the extent and frequency of shortages which might be considered tolerable; the amount of river losses and river gains which might be expected under the future conditions; the operating feasibility and difficulties of various proposed plans; the availability of reserve supplies to meet the needs of current and future development; and the reclamation of saline areas. The treaty plan also was to provide for storage of seasonal surplus to meet dry-season demands.

Last year, after the treaty was signed, and with full approval of the World Bank, TAMS received a contract from Pakistan for project planning and detailed design of Tarbela Dam and Reservoir, one of the two very large storage projects in the plan.

TAMS also worked for many years in Burma. Retained to do a comprehensive technical and economic survey, TAMS's job was to develop a \$1.5 billion, long-term program for transportation, communications, water resources and power development, industry, and mineral development. After completion of the plan, TAMS stayed on for six years as technical advisor.

## Lure of South America

McCarthy, who lived in South America for nine years, thinks South and Central America will be areas of great engineering activity within the next few years. "After all, the population is growing at a rate of about 2½ percent annually. Their continuing needs are great, without even raising the standard of living."

Among his many multimillion dollar projects, that which gave McCarthy the most personal satisfaction was the planning of water supply and distribution, plus a sewage system, for Caracas, Venezuela.

Shortly after World War II, Caracas had a population of about 240,000. To many, McCarthy's plans seemed a little optimistic. He detailed storage of surface water from the mountains above the city, and further development of ground water in the Valley of Caracas, with later plans to use water from a river on an elevation 2500 feet below the city. Current Caracas population — as a result of the birth rate, migration to the city due to improved transportation and communications, and substantial European immigration — is more than one million. "Growth of Caracas was so spectacular that almost before the mountain reservoirs above the city were completed, plans were being made to utilize the secondary river supply," McCarthy added.

McCarthy first went to South America in 1938 for Parsons, Klapp, Brinckerhoff & Douglas. Theodore T. Knappen, who had been McCarthy's boss in the Corps of Engineers, was under assignment for the Parsons firm to investigate the possibilities of developing engineering work in South America. During the next few years, McCarthy worked on port, water supply, flood control, and irrigation projects — mostly in Venezuela.

"When I moved to Venezuela, I did not remember much of my college Spanish. The Chief of Public Works in San Fernando de Apure spoke no English. However, we found that after many evenings in the Plaza Bolivar, we could understand each other."

Shortly after war was declared, Knappen returned to the States; McCarthy remained in Venezuela. By 1943, he was a limited partner in Parsons, Klapp, Brinckerhoff & Douglas, in charge of their South American operations. During the war, McCarthy also scouted sites for U. S. military bases in the Caribbean.

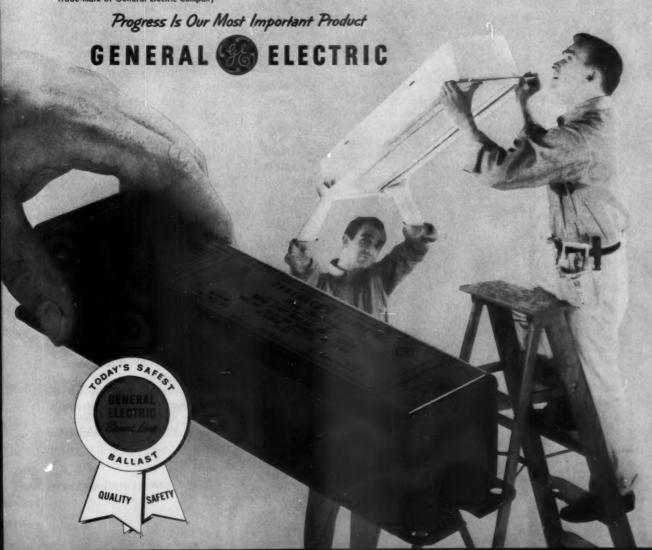
"My family and I enjoyed living in South America, and perhaps we would have stayed there, except that my son developed asthma due to the tropical humidity. In 1947 we returned to New York City, and shortly after that I joined Knappen in his firm."

## **Engineering and Politics**

Although he has made his home in Summit, New Jersey, McCarthy has been far from settled during the past 14 years. "All of our partners and associates travel much of the time. In fact, Christmas week is about the only time of the year when we can have a staff meeting with all of us present." The last time he counted, McCarthy had flown over 6000 hours — more than many commercial pilots.

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clients, and also to make periodic calls on prospective clients. McCarthy mentioned that in his firm, as in all others, the problem is finding the time to develop new business. "I guess it is a human frailty to neglect spending time getting new projects when your firm is working to capacity.'

In the course of his travels, McCarthy has met the heads of many governments. "I set my personal record a couple of years ago when I met the presidents of Honduras, Salvador, and Guatemala in one month. The next month, I met the heads of Burma, Thailand,

and Taiwan."

His contacts have led to some interesting situations. A few years ago, a government official in Colombia invited McCarthy to be one of the judges of the country's biennial beauty contest. "My wife and I spent an interesting week in Colombia that trip."

Several years ago, McCarthy caused some chaos in protocol circles when his personal friend, Prime Minister U Nu of Burma, on a good will trip to the United States, insisted on making McCarthy's New Jersey home his first stop. "We had state police, FBI men, and protocol officers all over the neighborhood. If the neighbors were curious as to 'what is a consulting engineer' before that, they were really interested in finding out afterward."

In his dealings with the various heads of state, McCarthy finds they have one thing in common. "Without fail, when in office they appear to be dedicated to their task and try to make their mark in history. In fact, some of the smaller countries have some of the best qualified leaders. They bear a heavier load, since usually they have a less complete staff."

TAMS has several definite policies on its foreign work. "We stay out of politics, both nationally and internationally. It is to the benefit of the United States to have foreign nations deal with American consulting firms in complete trust. We are engineers, not propagandists, and we make sure both our staff and our clients understand this."

Also, TAMS handles many reports in connection with loan applications. "We stick to engineering. Never have we appeared before a lending institution on behalf of a client. We deal only with accredited officials, who, in turn, work with the lending groups."

## **Engineers Abroad**

McCarthy thinks consulting engineers can make valuable contributions to the American image abroad. "The 'Ugly American' stories are exaggerated. Our men have been well received wherever they have been assigned. We usually send a few top engineers to work on an advisory and executive level, and use as many nationals on a project as possible. This is a valuable training aid to the nation in which we are working."

TAMS also has from five to 20 foreign engineers working in their New York office at most times. "We find the foreign engineers have excellent theoretical training, although they do not have the degree of specialization that graduates of American universities do. In a short time of working with our men, we find they greatly improve their capabilities."

McCarthy also is proud that four men who worked for him in Colombia later formed the consulting firm of OLAP, today considered among the best in South America. "Our training program is good enough so that, in some cases, it has cost us business - but it is

one of our most highly valued policies."

TAMS sends experienced men to head foreign projects, and the New York office is used as a training ground for future replacements. The first time a staff engineer is sent abroad on the U. S. Aid Program, he begins by spending two or three days with protocol officers in Washington. Then he is supervised carefully

on his early projects.

If a man is to be abroad less than a year, he is on 'bachelor' status. For assignments of one year or more, we send the families, when living facilities are available. We learn a little about a man's family before he leaves, but through the years we have had practically no trouble with dissatisfied wives causing men to leave foreign assignments. For instance, in Taiwan we have had from six to 15 men and their families on assignments for four years, and we have had only one man leave for any reason other than completion of his work, and this case was because of family sickness."

McCarthy thinks there is great opportunity for the Peace Corps to make contributions to underdeveloped nations, through basic training for the nationals. "However, the Peace Corps should be careful that the youths they send abroad realize their limitations. For example, a recent graduate trying to build a road could get into trouble and do more harm than good.

Another area in which McCarthy thinks more concern should be shown over proper engineering experience is development projects. "In the past, I have noticed a tendency on the part of the International Cooperation Administration to give the planning of development projects to universities. For example, Harvard University was asked to make a technical and economic survey of Pakistan, Any time an engineering appraisal is involved, I think an experienced engineering firm should be retained. The universities have enough problems in engineering education without trying to broaden their scope. However, each contract let to a university should be judged on its own merit."

McCarthy's firm has handled highway projects throughout the world. "At various times, from what I have observed, the Bureau of Public Roads seems to be expanding its engineering services abroad. For instance, much of the highway effort in Turkey was designed under the direction of Bureau personnel, although I will say I know of no consultant who was attempting to get the work at that time. Generally, the



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## **Government Engineering**

On the issue of private versus public design of foreign projects, McCarthy has put out his own "white paper" for distribution to the staff and any clients who might be interested.

McCarthy states that:

"On foreign projects, use of government agencies on preliminary reports, project plans, and supervision of construction, aside from the unfair competition of a public agency with private enterprise, is not always as efficient or as economical as using private engineering consultants.

"(a) The private firm furnishes an experienced team that is used to working together and is efficiently directed and controlled, whereas the government employees have seldom worked together before, and the authority of the chief of party is sometimes questioned or resented by his staff.

"(b) The private firm has a strong home office backstop organization, whereas the United States government team in the field cannot call on Washington or any other United States technical office with as fast a response or as much dependability.

"(c) The private firm can schedule its staff to the field when and as needed, and can frequently use them intermittently to the economy of the job by taking advantage of several concurrent operations in the same geographical area, sending staff consultants, geologists, hydrologists, economists, and others to the field for short periods when actually needed. The U. S. government finds it almost impossible to send men with such flexibility. Once it assigns a man to a project, for all practical purposes, the entire cost of his time must be charged to that job. Also, it is often necessary to mobilize him in advance of his initial needs, because the government cannot time its selection and hiring as closely as the private firm.

"(d) Private employees are exempt from United States income taxation if they qualify as nonresidents of the United States, or if they are out of the United States for 510 days out of 18 consecutive months. Therefore, their take-home pay for the same salary is usually greater than for the United States government employee in the field; consequently, better qualified engineers can be obtained for the same salary.

"(e) A private firm generally assigns experienced engineers to the field, who have carried on similar field surveys, whereas its is very difficult for the government to mobilize men of equal caliber.

"(f) The indirect costs of an engineering firm are no higher than the comparable costs for a United States government team, if they are all properly

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allocated and cost accounted. Since the net fee is actually a payment for services of an organization and for the time of the partners, it follows that greater value is obtained through use of a private firm than through use of a government team.

"(g) The private firm usually is in a position similar to that of being retained by the foreign government, and is therefore in a better position to receive orders from it and carry out its desires. The client country generally hesitates to differ with a United States government employee mission, be it a pick-up team or an established group from an existing gov-

ernment agency.

"(h) The private firm can act in an independent capacity and can make recommendations without any fear that they may have international policy or diplomatic implications. It has been found that the United States government employees usually have to get so many clearances from U. S. government superiors for many of their recommendations that their hands are practically tied. As a corollary, the U. S. government is glad to be relieved by the private firm of the responsibility of making many of these decisions or recommendations."

## **Professional Background**

McCarthy's grandfather, and his great-grandfather, came to America during the railroad building era. His father became a railroad construction and main-

tenance superintendent.

At Penn State University, McCarthy signed up for civil engineering, "although I probably would have majored in music if I had thought it would make as profitable a career." An amateur violinist, McCarthy was the head of his high school symphony orchestra and was a member of a string quartet that played on the radio. In college, he spent two or three hours a day playing with the symphony and a musical fraternity symphonic jazz band. Last year, McCarthy bought an 18th century German violin on one of his trips to Vienna. Still a member of neighborhood jazz groups, McCarthy hopes to retire someday, "and learn to play well enough to do justice to that violin."

After graduation, McCarthy went to work for New Jersey Standard Oil Company. "Less than a year later, the East Texas Oil Field was discovered, with a greater potential than all other oil fields in the nation combined. It disrupted the entire oil business, with crude selling at 10 cents a barrel. The company let many of the employees go, and I was transferred to service station construction, but resigned because I wanted experience on civil engineering projects."

When a junior in college, McCarthy had taken a Civil Service examination out of curiosity. Just about the time he quit the oil company, he was offered a job with the Corps of Engineers on the Mississippi River. The "308" report – this nation's first study of



LAKEVIEW MEMORIAL HOSPITAL, Stillwater, Minn. ARCHITECTS: Ellerbe & Company. CONTRACTORS: C. H. Peterson Construction Co.

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The first general acute hospital in the United States to use the new "cloverleaf" design, Lakeview Memorial Hospital at Stillwater, Minn., is a marvel of planned functional efficiency.

Three circular wings extend from a rectangular center section. Rooms with 67 beds are at the outer edges of the circles with nurses stations in the centers. Nurses never lose visual contact with patients...are never more than 20 feet from them.

Food service, too, is ultramodern. A STANDARD CONVEYOR Traylift (right) carries trays of food from kitchen to serving areas, carries soiled dishes down again—swiftly, silently and safely. In the ground floor kitchen a STANDARD CONVEYOR Traybelt (below) simplifies make up of individual food trays and speeds them to the Traylift.

As the modern way to efficient food service, STANDARD CONVEYOR mechanized dish handling systems offer many advantages.

By providing a fast and economical way to transport trays, they let you locate kitchen and dish washing areas remote from dining areas. They allow planning for efficient service with reduced personnel requirements. They provide faster food service with reduced dish breakage. And best of all, they pay for themselves fast out of operational savings.



Standard Traylift makes quick work of carrying soiled dishes down from first-floor serving area (above) to ground-floor dishwashing room (below). Reversible model also allows up-service for food trays from kitchen to patient floor. Other models featuring simultaneous up-and-down service, push-button selection for serving more than two floors, and completely automatic loading and unloading are also available.





Standard Traybelt speeds make up of food trays, carries them safely to the Traylift. Many other models are available to meet a wide variety of food service requirements.

LISTED IN SWEET'S-SECT. 24d/ST . SALES AND SERVICE IN OVER 40 CITIES-SEE YOUR YELLOW PAGES.



Standard Conveyor

313-L Second St., North St. Paul 9, Minn.

If you have a project pending where you'd like to give your client the benefits of streamlined dish and tray handling, Bulletin 120 can help you to determine models needed and general structural requirements. Write today for your free copy. Or, if you prefer, simply clip this ad to your business letterhead and mail it . . . Your AIA File 35-C-13 is not complete without it!





flood control, navigation, and power potential of all major rivers in the nation — was getting under way.

Most of McCarthy's work was in the writing and review of technical reports during this time. He helped develop a number of techniques for hydraulic and economic analyses of flood control. Although the methods have been refined, they still are in use today.

McCarthy later was transferred to the Zanesville District at the request of Knappen, the chief engineer. This district was given the assignment of completeing designs and bidding details on 14 dams and reservoirs in one year. "We met the deadline," he recalled.

With the New England floods in the late 30's, Mc-Carthy was transferred to that area.

## **Society Affiliations**

Today, McCarthy spends about one-third of his time on professional society activities. As president of the American Institute of Consulting Engineers, much of his time has been spent on membership. "We must grow to keep up with technical and economic developments. The average age of our membership is rising, and for some time the deaths were almost equal to new admissions. There are many experienced and highly qualified consultants in this country, and many of them would be a credit to the Institute as members. I have been privileged to have quite a few join during my term of office. Any organization moves either forwards or backwards, and the Institute is determined to stay headed in the right direction."

McCarthy said he has become acquainted with the Consulting Engineers Council during the last few years, and is not a member primarily because of time limitations. "I have been happy to see close cooperation between the Institute and the Council, because I feel we have many mutual objectives. There is a need for both groups. The Institute is the senior national organization, with much more rigid qualifications for membership. CEC also has a broad national representation through the large membership of its state associations of consulting engineers. They have many members I admire greatly."

In addition to membership in the Institute and USCOLD, McCarthy is a Fellow of the American Society of Civil Engineers and a member and former director of the U. S. Committee of the International Commission on Irrigation and Drainage. He is a director, representing the engineering profession, of the International Road Federation and of the IRF Educational Foundation.

Among the more exotic-sounding groups of which he is a member, McCarthy lists the Far East-America Council of Commerce & Industry (board of directors); the Pan American Society; the Bolivarian Society of the U. S.; the Argentine-American Chamber of Commerce Inc.; The Canadian Club of New York, Inc.; and the Venezuelan Chamber of Commerce.

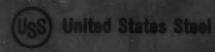
## Take a good look at what you can do with the complete family of (158) Design Steels

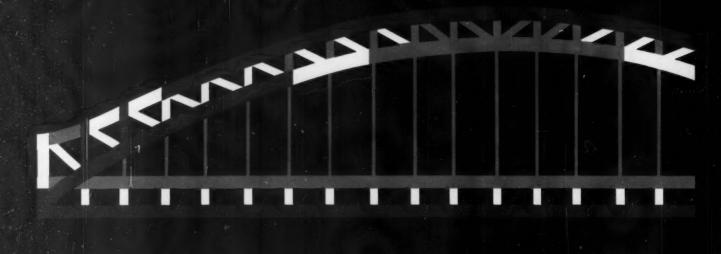
Over the past 50 years, the steel industry has developed at least 10,000 new steels! Many of these steels have been proved thoroughly on the job and wait only for the design magic of the right engineer, the right architect or the right designer to put them to use in stronger, safer and more economical structures.

Designers of buildings and bridges now have a whole "family" of USS Structural Carbon Steels,

Steels available in the necessary shapes with minimum yield points ranging from 32,000 psi to

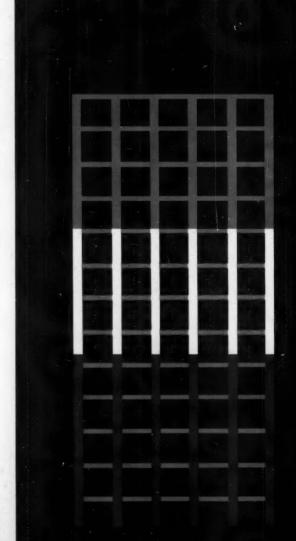
Several bridges and buildings have already bethe built combining these various steels into one structure to obtain maximum strength, light weight and economy—but all kinds of interesting developments lie ahead. It should be a challenge to designers to

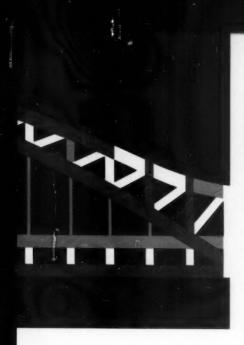




Design
Steels
that do
the most
to reduce
construction
costs

New concept of design for buildings and bridges—get the most out of the family of steels by using them wherever they will improve design, reduce weight or effect over-all savings in construction.





Pound for pound, these stronger steels shoulder heavier loads... or they reduce the size and weight of structural members and foundations. They add valuable floor space to buildings, reduce freight costs and result in faster erection with earlier occupancy . . . all money-saving advantages.

New design concepts are emerging that challenge the designer's imagination and ingenuity. The combining of many steels to get the most out of them has long been practiced by automotive engineers and some other designers. It has given us the best automobiles, the highest television towers in the world, the largest earth-moving equipment and giant radio telescopes.

ASTM A7 Structural Carbon Steel is a mighty versatile and potent metal. No other material so strong (minimum yield point 33,000 psi) and selling at a material cost of less than 10 cents a pound, can be drawn, welded, forged, riveted, punched, and painted so readily and safely. A more weldable carbon steel (A373) has a minimum yield point of 32,000 psi.

ASTM A36 Structural Carbon Steel. The higher yield point of 36,000 psi and the low price indicate that this important new steel may become the predominant structural grade, and that it may displace A373 in welded construction. A36 steel gives the designer the opportunity to provide lighter-weight structures at a low cost. It has been accepted for both building and bridge construction at a basic allowable design stress 2,000 psi higher than A7 steel (20,000 allowable design stress for bridges, 22,000 for buildings). It can be used for riveted, bolted and welded fabrication.

**USS High Strength Steels** 

All have minimum yield points of 50,000 psi. Each has specific area applications where it will do the very best job.

USS MAN-TEN Steel (A440) is a highstrength carbon steel intended for riveted and bolted construction. It is the most economical of the high-strength steels; has good workability, high resistance to abrasion, and atmospheric corrosion resistance double that of plain carbon steel. Since it provides a yield point 50% higher than A7 steel, engineers can design with higher unit working stresses and achieve real reductions in steel size, weight and costs.

USS TRI-TEN Steel is a high-strength low-alloy steel intended primarily for use in welded construction. This steel meets all requirements of ASTM A441. It provides greater toughness, even at low temperatures, and has twice the atmospheric corrosion resistance of car-

bon steel. TRI-TEN Steel has been widely used for bridges, buildings, machinery and railroad equipment to reduce weight and costs or to provide increased strength and load capacity without increased weight.

USS COR-TEN Steel is recommended for all applications in which relatively high resistance to atmospheric corrosion is considered necessary. It permits the use of thinner sections to take advantage of the increased strength of the material, or the use of equal or heavier thickness for extended life with or without protective coating. Paint lasts up to twice as long on COR-TEN Steel as it does on carbon steel.

USS "T-1" Constructional Alloy Steel. This is the "superman" of structural steels with a minimum yield strength of 100,000 psi. It is furnished quenched and tempered and is readily weldable. It has four to six times the atmospheric corrosion resistance of structural carbon steel and possesses exceptional toughness over a wide range of temperatures down to -50°F. "T-1" Steel combined with USS TRI-TEN High-Strength Low-Alloy Steel and carbon steel has already been used in a number of bridges. In Carquinez Strait Bridge in California, it saved \$800,000 with big savings in weight. This led to its use in Martinez Bridge nearby, Louisville-New Albany, Whisky Creek and others under design. "T-1" Steel is available in standard structural shapes as well as bars, semi-finished and sheets.

USS "T-1" type A Constructional Alloy Steel. This is a lower-priced steel with the same high yield strength of 100,000 psi in thicknesses up to 1 inch. It can be used in highly stressed members to obtain maximum strength, with reduced size, weight and costs. It is available in the same shapes as "T-1" Steel.

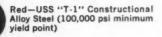
For more information on any of these USS Steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

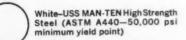
USS, "T-1," MAN-TEN, TRI-TEN, and COR-TEN are registered trademarks.

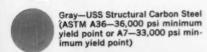
United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal & Iron Division • United States Steel Supply Division • United States Steel Export Company

## **United States Steel**









## Now Available...



## QUENCHED AND TEMPERED STRUCTURAL SHAPES

## in such grades as "T-1", "T-1" type A, 9% Nickel and HY-80 **Constructional Alloy and Armor Steels**

Announcing another industry "first" for United States Steel-USS Quenched and Tempered Alloy and Armor Steel Structural Shapes are now commercially available for the first time anywhere, in the types and sizes shown in the accompanying tables. The more commonly used sizes of Wide Flange Beams, American Standard Beams, Channels, Equal Angles and Unequal Angles will be produced in these USS Steels: "T-1", "T-1" type A, 9% Nickel, HY-80 and certain other alloy grades that provide desirable mechanical properties after quenching and tempering. Later, other sizes and shapes will be added according to demand.

These quenched and tempered alloy and armor steel structural shapes (see table below) can simplify design and result in substantial weight savings, increased structural strength and reduced shipping and handling costs. For a free folder about any of these steels or their structural shapes, contact your local USS representative or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS and "T-1" are registered trademarks.

United States Steel Corporation . Columbia-Geneva Steel Division • Tennessee Coal and Iron Division . United States Steel Supply Division • United States Steel Export Company

## Availability Quenched and Tempered standard structural shapes are available in the following shapes and sizes:

| I | Beams: 8" to 16" inclusive                    | Selected Wide Flange Sections and Foot Weights®                         |  |  |
|---|---|---|--|--|
| I | Beams: 6" to 12" inclusive                    | American Standard Sections and Foot Weights®                            |  |  |
| [ | Channels: 6" to 15" inclusive                 | American Standard Sections and Foot Weights*                            |  |  |
| L | Equal Angles: 3" to 8" inclusive              | Standard Sections*  |  |  |
| L | Unequal Angles: 3½" x 3" to 8" x 6" inclusive | Standard Sections* *See our booklet, "USS Shapes & Pietes," ABUCO-27001 |  |  |

Maximum length 40' for all sections

## Mechanical Properties of Quenched and Tempered Alloy and Armor Steel Structural Shapes

|                              | Yield Strength,<br>psi | Tensile<br>Strength, psi | Elong. in 2°,<br>% min. | Reduction<br>of Area,<br>% min. | Longitudinal Charpy Impact (when specified |                   |
|------------------------------|------------------------|--------------------------|-------------------------|---------------------------------|--|-------------------|
|                              |                        |                          |                         |                                 | Keyhole                                    | V-notch           |
| "T-1" Steel<br>2½" and Under | 100,000 min.           | 115,000/140,000          | 18                      | 55①                             | 15 ftlbs. @ −50F                           | 30 ftlbs. @ +10F  |
| "T-1" type A<br>1' and Under | 100,000 min.           | 115,000/140,000          | 18                      | 55①                             | 15 ftlbs. @ -50F                           | _                 |
| Grade A<br>9% Nickel         | 60,000 min.            | 90,000 min.              | 22% min.                | -                               | 15 ft.·lbs. ⊛-320F                         | 20 ftlbs. ⊜ -320F |
| Grade B<br>9% Nickel         | 65,000 min.            | 95,000 min.              | 20% min.                |                                 |  |                   |
| HY-80<br>¼'-2' Incl.         | 80,000/100,000®        |                          | 19@                     | -                               | _  | 70 ftlbs. ⊜ -120F |

0¾' and under-45% min.

1%' and over, yield strength range is 80/95,000 psi 1%' to 2' inclusive, elongation 20% min.





## Haughton DYNAFLITE Control

## will provide fastest floor-to-floor time with complete comfort!

This is the 570 Broad Street Office Building, Newark, New Jersey. Now under construction, its 14 floors will be served by four Haughton Operatorless Elevators with totally new *Dynaflite* control. With this control, floor-to-floor time can be incredibly fast, because starts and stops are so precisely controlled every time, and are so gentle that passengers scarcely feel any motion at all. Thus Dynaflite combines speed and comfort to provide unmatched efficiency and passen-

ger well-being... and enhance building prestige and rentability. Haughton Dynaflite control is ready to serve your buildings today, thanks to Elevonics\*... the new technology in vertical transportation that has created new standards for excellence in elevator performance. Include Dynaflite's distinctive advantages in your building or modernization plans. Ask your Haughton representative for complete details, or write us, without obligation.



## A HAUGHTON 7-PROGRAM SYSTEM

will anticipate in advance the varied traffic conditions encountered in the 570 Broad Street Building. An "electronic brain" will automatically dispatch cars at proper times, in the proper sequence... avoiding the congestion of "rush hours" and "coffee breaks." This type of predetermined service can work wonders in your installation.

\*Houghton's advanced program in elevator systems recearch and engineering, with specific emphasis on the creative application of electronic devices and instrumentation for bettermant of exchang design and performance. See, in 11. 5. See, Art

## HAUGHTON ELEVATOR COMPANY

DIVISION OF TOLEDO SCALE CORPORATION

Toledo 9, Ohio Offices in Principal Cities
PASSENGER AND FREIGHT ELEVATORS - ESCALATORS - DUMBWAITERS



Electro-Mechanical Strength is just one of <a href="three">three</a> vital requirements for Service Entrance switches. The other two: Operating Performance and Load-Break Dependability. Specify the switch that's proven in these areas.

The Pringle LOAD BREAK Switch for Service Entrance duty was tested for these minimum standards. Electro-Mechanical Strength sample: switches closed against maximum station short circuits (130,000A. 510V.)—no damage! Another: switches were subjected to maximum station (110,000A. 610V.) for 5 full cycles—again, no damage.

See the proof yourself. Send today for the fully detailed Report on the recent series of tests, Just ask for Test Report Bulletin P-112.

Pringle ELECTRICAL MANUFACTURING COMPANY

1902 N. SIXTH ST., PHILADELPHIA 22, PA.



A Short Story . . . August 22, 1961

We have read with a great deal of interest your article on the planners in New Jersey in the August 1961 issue of your magazine. We want to compliment you on the way you have presented the facts concerning the planners in New Jersey. As you know, we have been in this turmoil or battle for some three or four years, and we personally have been at the front lines most of the time. We have known the facts, and you have certainly done an excellent job in presenting them in your article.

This fight is still continuing, and we are wondering if it is possible to receive reprints of the article. It would be of extreme value to us in our current wager against the planners. In fact, the legislature in New Jersey is coming back in session on the 28th of August, and it is quite possible that this bill, known as A546, will come up again If reprints are available we would like sufficient copies to distribute to each member of the legislature in New Jersey.

John G. Reutter New Jersey Association of Consulting Engineers

... with a Happy Ending September 5, 1961

This is to advise you that we took the copy from Consulting Engi-

## Readers Comment

NEER magazine and forwarded it with a covering letter to Assemblyman Werner. We specifically requested that he use it as he saw fit concerning the planners bill.

We are confident that he used it during this past week to good advantage, as he has been successful in keeping the bill from being yoted on in this session.

Again, we wish to thank you for the interest you have taken in the advancement of consulting engineering, and compliment you on this fine article.

> John G. Reutter New Jersey Association of Consulting Engineers

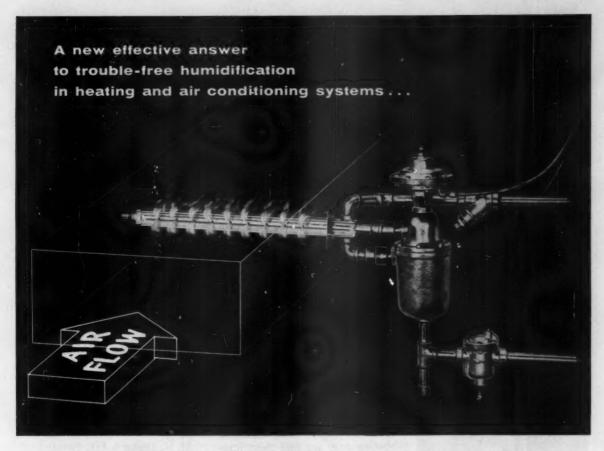
## Answer

The following is a reply to comments by H. F. Bjork of Dr. Katzen's article in the June issue. Bjork's comments appeared in the September "Readers Comment."

Your letter was received while I was away on an extended trip to South America. Thank you for the several informative enclosures.

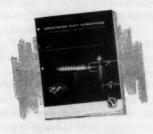
My major sources of information are listed in the bibliography attached to the article. The reference to "forced circulation multiple effect evaporation" results from the fact that the pilot plant utilized in developing your process had forced-circulation units. In the 1959 report which I had for reference, it was not clearly indicated that the full-scale installation would not utilize forced circulation. To this extent I must stand corrected.

Incidentally, the article was written in February, before your plant



## ARMSTRONG DUCT HUMIDIFIERS

with steam jacketed distribution manifold



Bulletin 504 gives complete data on Armstrong Duct Humidifiers . . . how they work . . how they avoid duct condensation . . dimensions . . . capacities . . . sizing information . . . and how they can be installed . . . Ask for a copy.

The Armstrong Duct Humidifier with steam jacketed distribution manifold answers the most critical requirements of duct humidification by providing—

- A drip-free means of introducing water vapor to the air flow in the form of dry steam.
- Uniform distribution of moisture across the width of the duct to avoid condensation points.
- Accurate, responsive control of the amount of water vapor introduced into the air flow.
- Moderate first cost, minimum maintenance and low operating cost.

Armstrong Duct Humidifiers are offered in two sizes, and are either air operated or electrically operated. Stainless steel distribution manifolds are furnished in seven lengths from 1 foot to 6 feet, Capacities are set to avoid the possibility of duct condensation.

We will be pleased to have your nearby Armstrong Representative show you how your clients will benefit from Armstrong humidification. Call or write, today.



ARMSTRONG MACHINE WORKS

9652 Maple Street • Three Rivers, Michigan

Also Manufacturers of Steam Unit Humidifiers... Evaporative Humidifiers... Steam Traps... Air Relief Traps



Operating Performance is the second of three vital "musts" for Service Entrance switches. The first is Electro-Mechanical Strength, the third—Load Break Dependability.

The Pringle LOAD BREAK Switch for Service Entrance application was put through severe tests for reliability. Sample of Operating Performance: at 130% rated load, 44 separate opening and closing operations. Another: 50 successive operations of the switch at 150% rated load. (In both cases, the tests could have been continued indefinitely without damage to the switch!)

Send today for proof of Pringle's unmatched reliability. Just ask for Test Report Bulletin P-112.

Pringle ELECTRICAL MANUFACTURING COMPANY

1902 N. SIXTH ST., PHILADELPHIA 22, PA.

was reported to be completed. The delay in publication until June was caused by the journal, and makes several comments appear to be out-of-date. The manuscript of the article was submitted to the Office of Saline Water in March, and they did not question my statements on costs.

As for costs, I suggest you reread my article carefully. On page 106, first column, line 7, I state that the demonstration plants cannot produce water for less than \$1.00 per 1000 gallons. Your own report confirms this on page 15.

I believe your claims for production of potable water at a cost of 35¢ per 1000 gallons on a larger scale are extremely optimistic, if not unrealistic. For example:

¶ Where can you borrow money for 3%? Industrial firms have to pay 4 - 6% for such money.

¶ I do not believe I have seen any well run plant which can get along on 3% for maintenance materials and labor. 4 - 5% is more realistic. ¶ Amortization may be charged at 5% for tax purposes, but in view of obsolescence, we find most firms figure it at 10%, to insure adequate reserves for replacement.

¶ With "cheap" fuel at 30¢ per million Btu, we find that our clients value low-pressure steam at 40 - 50¢ per 1000 pounds. And where are you going to find the ideal power plant which will deliver just the quantity you want at the pressure you desire?

Your invitation to visit the Freeport facility is appreciated, and I hope to be able to take it up soon. Meanwhile, thanks for your offer of additional information.

Raphael Katzen Raphael Katzen Associates Cincinnati, Ohio

## Comment from India

We have been very busy at Dastur & Company during the last year and will probably be even busier in the years ahead. We have recently concluded a contract with Hindustan Steel Limited (govern-

ment corporation handling steel expansion program) for the complete project report, engineering, and design of a large new integrated steel works at Bokaro. This will be the first time that a project of this magnitude — \$450 million — will be engineered entirely within the country utilizing indigenous talents. As you perhaps know, the U. S. steel industry has expressed some interest in financing the supply of American equipment for this project.

Our organization has expanded greatly and, needless to say, your magazine is in great demand. In the past we have been getting one copy of the magazine but we would much appreciate receiving two copies from now onwards.

I have just returned home after heading up an Indian Productivity Team which spent two months in the USSR to study its iron and steel industry. We have come back highly impressed — and a little alarmed — at the stupendous progress the Russian steel industry is making.

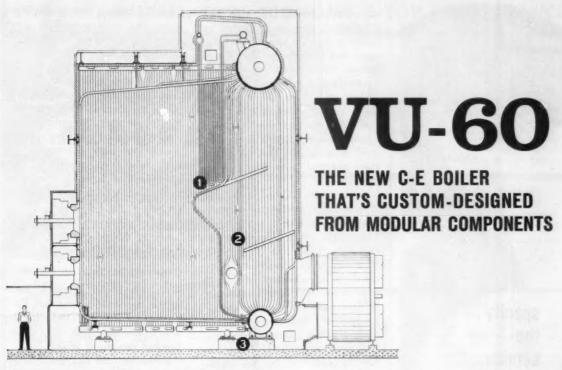
R. D. Lalkaka M. N. Dastur & Co., Private Ltd. Calcutta, India

## **CSI** and **Professionalism**

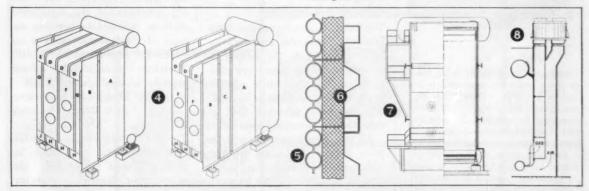
Congratulations on your objective coverage of the New York Convention of Construction Specifications Institute (July 1961).

Possibly there are some who will be alarmed by certain pronouncements by Mr. Will (president, AIA); namely, "I know of no law which says . . . that government cannot create more bureaus to provide whatever services and products an impatient public may demand." And, "Remember that non-professional enterprise bears no burden of sentimental nostalgia, but seeks its profits with a cold and realistic approach."

This sounds a little — either way you look at it — like the philosophy that "might" makes "right," and if pursued, will mean the loss of more of our freedoms, either to monopolies which are the cold



- The VU-60 can operate over a wide load range while maintaining superheated steam temperatures close to the design
- Cross-flow baffling and symmetrical boiler bank assure low draft loss, eliminating sluggish flow in any pass.
- 3 Only a simple reinforced-concrete slab is required. No conventional roller supports are
- Modular components allow proportioning of boiler for best combustion, heat absorption and gas flow-even where space problems exist.
- 5 The VU-60 is an all-welded, pressure-tight envelope composed of modular panels of finned tubes. Minimum field welding cuts erection time.
- Insulation and pre-formed lagging are applied directly over tube panels. This reduces nonworking weight per pound of steam generated.
- 7 Front elevation shows simplicity of platform arrangements. Platforms are attached to the boiler itself, minimizing the need for additional supports.
- 8 Where top outlet is desired, air preheater may be located above unit, as illustrated.



## **VU-60 SPECIFICATIONS**

Capacities: 100,000 to 250,000 lb/hr Design pressures: 250, 500, 750, 1040 psi

to 900F Steam temperatures:

Fuels: Oil and/or gas

Firing: Horizontal (front wall) or tangential

Depth-twelve Size increments: Width-eight Height-three

Four Steam drum sizes:

The VU-60 can be designed to meet your most exacting steam needs. It's easy to install, economical and reliable in operation, completely accessible and functional. Get full information on how this new concept can fulfill your specialized requirements.

## COMBUSTION ENGINEERING



General offices: Windsor, Connecticut New York offices: 200 Madison Avenue, New York 16

ALL TYPES OF STEAM GENERATING, FUEL DURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SQIL PIPE



Load-Break Dependability is the third of <a href="three">three</a> important requirements for Service Entrance switches. The first two: Electro-Mechanical Strength and Operating Performance. Be sure the switch you specify exceeds all in-service requirements in these basic areas.

Extensive tests were run on the Pringle LOAD BREAK Switch to prove its reliability. Example of Load-Break Dependability: Switch opened and closed against 15,000A. 510V. — no damage to the switch! Also, switch opened 22,000A. 510V. — again no switch damage.

Get the full detailed report. Just write for Test Report Bulletin P-112.

Pringle ELECTRICAL MANUFACTURING COMPANY

1902 N. SIXTH ST., PHILADELPHIA 22, PA.

approach to profits, or to expanded government agencies supported by us taxpayers. We already have too many and variable building codes around the country which were the result of the demand by an impatient public to do something about defective construction.

If CSI members want to make a profession out of their work, they must soon realize that there are four essential ingredients of a profession:

¶ A systematic body of knowledge of substantial intellectual content, and skill in its use

¶ Standards of conduct for its members

¶ An association of members dedicated to advancement of knowledge in the field, and maintenance of the standards by its members

¶ Admission requirements based on competence in training, experience.

Sanctions, or codes of ethics, adequately enforced by the applicable professional associations, are the chief bulwark against monopolies and undesirable practices which stimulate government interference in our free society.

Lindsay H. Welling Scarsdale, New York

## **Automation Is Not Free!**

The letter in the September 1961 issue of Consulting Engineer by Paul S. Amber on the subject of automation is one that very concisely presents the nub of a major problem. This problem is one that is encountered in every field of consulting engineering practice.

All too often customers or prospects request quotations together with technical information, which enables them to go after competitive prices and, in some cases, do the engineering work themselves.

As a result, several companies in the field of automation devices, including our own, now request a token payment for an expanded proposal. On the basis of our experience with this procedure for the past several months, we believe we have eliminated the curiosity

seekers, although we may also have eliminated some potentially good customers. However, a review of the situation shows that the request for quotations received in this office have dropped over 50 percent. The record of accepted proposals has risen about 6 or 7 times the former rate. Accordingly, we have found that charging a small amount for such a proposal has been most effective with us. We recommend that other companies in this industry also adopt this practice.

S. S. Aidlin, P. E., President Aidlin Automation, Inc. Brooklyn, New York

## Corporate Practice . . . Illinois

My good friend Leonard Todd says in the October issue that "Corporate practice laws (including the new Illinois act) [permit] . . . unlicensed persons as officers."

I believe that Mr. Todd is referring to Illinois Senate Bill 804. This does not permit "corporate practice" but does authorize the formation of professional associations by licensed persons. Section 8 of this act says, "Officers... shall be members of the professional association." Section 1 says that "all members of the association shall be licensed to perform the type of professional service for which the association is formed." Therefore I conclude that officers must be licensed under this act.

CEC Model Law Committee S. A. Bogen, Chairman

The words "including the new Illinois Act" should have read "including Illinois House Bill 1429" in my letter which dealt with corporate practices laws generally (Consulting Engineer, October 1961, page 19). I am glad Sam Bogen pointed out that it was the professional association Senate Bill 804 which the governor signed into law, and not the corporate practice House Bill 1429.

Leonard M. Todd Consulting Engineer

## FOR EASY INSTALLATION, ECONOMY & TOP PERFORMANCE



Low NPSH—Smooth, quiet operation • high efficiency • less initial cost and lower operating expense • compactness

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These Aurora Pumps and units are available in many different types and capacities for every type and size of operation. They are quality built for long, trouble-free operation. When maintenance is necessary, repairs can be made quickly and easily to get the pumps and system back in operation fast.



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For high capacities with special conditions...packing box only...ideal for applications where return is extremely low or below floor level... available as either simplex or duplex units. Capacities to 100,000 EDR—pressures to 60 PSI.



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Maximum simplicity . . . single stage . . . mechanical seals . . . optional self-priming feature. Capacities to 30 GPM . . . Heads to 350 feet.



## CLOSE-COUPLED END-SUCTION

With self-venting vertical discharge...interchangeable mechanical seal or packing inserts...low NPSH...unique suction spool arrangement. Capacities to 1800 GPM and heads to 320 feet—also available with flexible coupled drive.



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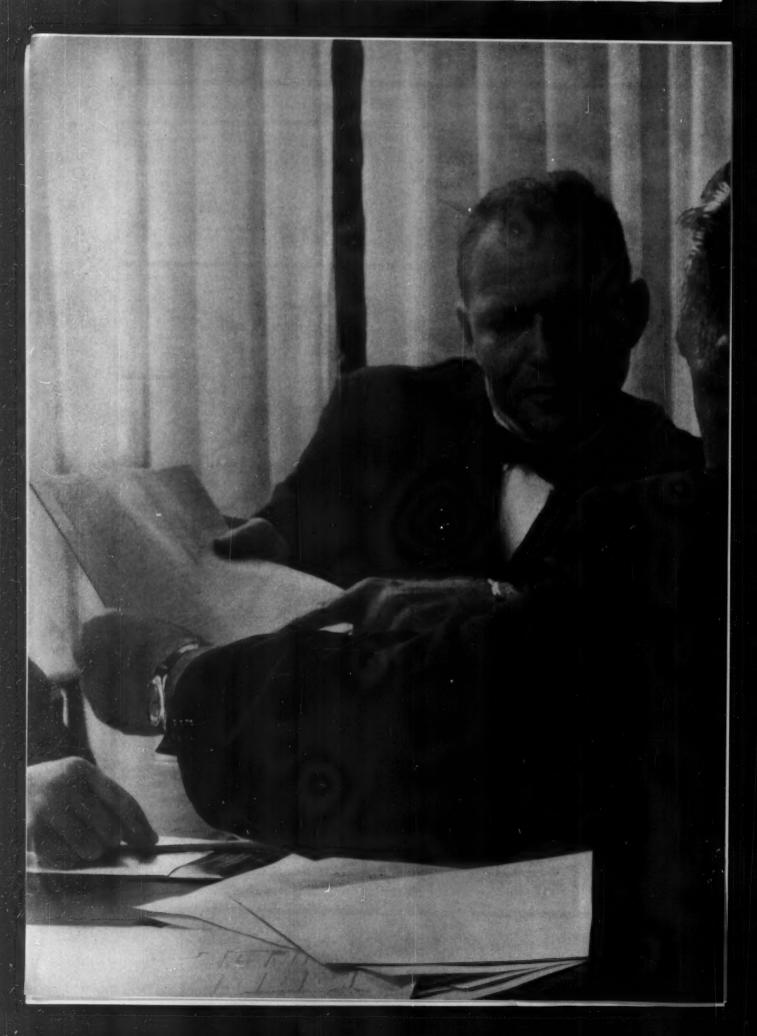


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## From the Editor's

## Tranquil Tower

## The Realities of Fee Schedules

FOR SOME TIME now it has been the custom of consulting engineers to drop into a surreptitious sotto voce when discussing fee schedules. And well they might, for attorneys general, both state and national, see price fixing implicit in every published fee schedule.

By way of contrast, the medical doctor remains totally unintimidated. Only last May the American Medical Association made the headlines of the local papers again, by courtesy of the Associated Press. The subject? A guide for setting medical fees.

Our legal friends are quick to point out that the doctors have not adopted a fee schedule. Rather, they have adopted a point system. Thus, if a house call is rated at one point, a minor operation might well be rated at 10. There are no dollar signs in the national point system. However, it is a simple matter for the local medical associations to assign each point a specific dollar value and, thus, effectively establish prices for the work of local practitioners. It is doubtful if this system will deter the doctors from playing their traditional Robin Hood role; nevertheless, if a doctor wants a fee schedule, there it is.

It is obvious that there is something wrong with the fee schedules adopted by various engineering groups for use in establishing the fees for consulting engineering services. First of all, most experienced firms feel that they are both inaccurate and inadequate. Second, they are presented in such a manner that, to the uninitiated, they clearly indicate price fixing. Last, but by no means least, legal analysis of many engineering fee schedules for consulting services indicates that they are probably illegal under the provisions of the Sherman Antitrust Act.

Since many states have put into the law their own versions of the Sherman Act, engineering fee schedules are suspect under the law at both the state and the Federal level of government.

It is about time for consulting engineers to slow down and carefully scrutinize the multitude of fee schedules surrounding them. It is our belief that, as professionals, consulting engineers have a right to prepare recommended fee schedules. Unfortunately, this is a philosophical rather than a legal opinion. Therefore, if existing fee schedules are worthy of the profession, their right to exist should be firmly established in law. In other words, consulting engineers must work to get passed, on the state and national level, legislation which clearly will exempt professional services from antitrust and other laws that seem to have a bearing on the legality of existing fee schedules.

The other approach open to the consulting engineering profession is to scrap existing fee schedules in favor of a fresh approach to the problem. There is good evidence to support the contention that, if this is done with the aid of competent legal counsel, new fee guides can be developed which will be completely acceptable under existing laws, both state and Federal, and which will be considerably more useful to engineers in private practice.

Once the onus of illegality is removed from professional engineering fee guides, they can be debated in open forum with the inevitable result that they will be kept up to date and present a realistic appraisal of the financial needs of the professional practitioner. The success of this approach is contingent upon the professional engineer's recognition of his need for the professional advice and counsel of the attorney-at-law. Too often, professional engineers have failed to recognize their ignorance of the law. This has cost them dearly, as the present wrangle over the model registration law clearly indicates.

The preservation of some standard for the establishment of engineering fees is vital to the continuation of the private practice of engineering. It can be done by; (1) promoting legislation to establish clearly the legality of existing fee schedules, or (2) writing new fee guides which are legal under the existing laws of the land.



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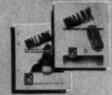


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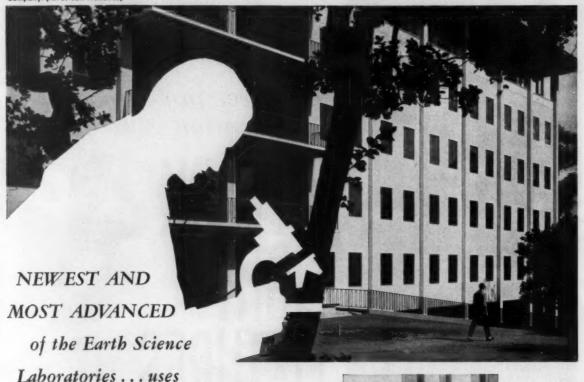
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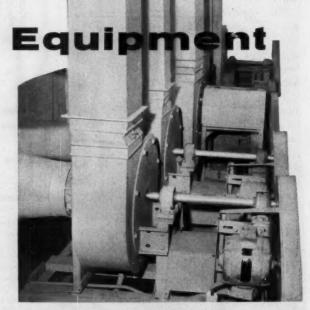


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## The Legal Aspect

DR. MELVIN NORD

Registered Engineer
Attorney at Law

#### Experimental Evidence

ON JULY 9, 1958, a Federal court in Kansas decided the case of Miller's Nat. Ins. Co. v. Wichita Flour Mills Co. (257 F. 2d 93), an action brought by the owner and operator of a grain elevator against 18 insurance companies for the loss which resulted from a breakout that occurred while a storage bin was being loaded with wheat.

Plaintiff claimed the breakout was caused by a dust explosion, which was covered by the insurance. Defendants blamed the breakout on a structural failure, not covered by the insurance.

The breakout occurred in interstice bin 314, which was surrounded by circular bins 105, 106, 505, and 506. The total height of the structure was 100 feet, with the gallery 10 feet below the roof. The bins were mounted on a concrete slab, below which was a tunnel housing the grain-removal facilities.

At the time of the accident, there was no grain in any of the circular bins. Bin 314 was being loaded with wheat at the rate of 6000 bushels per hour, and was filled to within 9 feet of its capacity. A breakout occurred affecting the exterior walls of the interstice bin and adjoining portions of two of the circular bins. The interior walls of 314 and the interior walls of 106 and 505 also were damaged. The lower 25 or 30 feet of the bin ruptured, and on

one side, the wheat poured out on the ground for a distance of about 85 feet. On the other, the wheat pushed a boxcar onto its side. Some heavy slabs of concrete were carried for distances of as much as 75 feet from the bins.

Shortly before the breakout, an employee of plaintiff, who had just measured the height of the wheat in 314 and was now about 135 feet away from it, felt a swish of air on the back of his head — "just like someone had turned a giant fan loose." This was so unusual that he went back to see if the conveyor belt and tripper were operating properly. He discovered the breakout and shut off the machinery.

There also was other testimony about unusual noises at the time of the breakout — plus reports of a cloud of black dust, blacker than wheat dust usually is. On the other hand, there was some evidence by witnesses that, 15 minutes before the breakout, they had noticed a cracking of concrete at the base of bin 106.

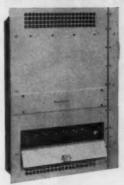
The walls of the circular bins surrounding 314 were shifted or displaced in some places as much as 15 inches. The concrete slab base of the bins was damaged and showed spalling, shearing, and cracking. One of the beams supporting the gallery floor was dislodged and broken away. No

#### UNIQUE SOUND SYSTEM design



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stretching or elongation of the steel reinforcing rods was found.

Plaintiff's expert witness expressed the opinion that a flash explosion had occurred in the gallery above bin 314 where the spouts from the tripper were dumping wheat, and that the shock of the explosion against the wheat in the bin was transmitted to the walls and carried to the point in the base where the walls failed. He also testified that in his opinion, dead weight did not cause the breakout. He gave these supporting reasons:

The concrete was displaced a greater distance than it would have been by a mere structural collapse.

The shattering of the concrete and the separation of the concrete from the steel reinforcing rods indicated that the failure had been abrupt and severe.

The damage to the concrete floor under the wall of the bins evidenced it had been subjected to a shock load, which could not have been caused by dead weight.

The greatest displacement of bin 506 was at a point where there was no dead weight load.

¶ There was no stretching or elongation of the steel reinforcing rods. ¶ The angle at which the wheat came to rest after the breakout was less than the usual angle of repose. ¶ The potential for a dust explosion existed at the time of breakout.

The noise was reported.

A number of experts for the insurance companies, on the other hand, testified that in their opinion there was no explosion, but rather a structural failure. They stated unequivocally that the dead weight in the structure (which they criticized) exerted a sufficient force to rupture the bin walls.

During the trial, the plaintiff also showed moving pictures of experiments conducted by plaintiff's witnesses. The insurance companies objected to the pictures and testimony relating to the experiments on the ground that such experiments were misleading and were not performed under conditions substantially similar to those which existed at the time and place of the occurrence in question. The motion pictures concerned such matters as the presence of voids in stored wheat; loading and explosive pressures on the bottom, center, and top of a tank filled with wheat; and the transmission of an explosive force. There was no claim that the conditions and situations were substantially similar to those existing in plaintiff's bin at the time of the breakout. The jury was instructed that the pictures were admitted only to illustrate certain principles "which plaintiff contends are applicable to this situation."

In its verdict, the jury awarded over \$109,000 plus interest. On appeal, this was affirmed, over the defendant's contentions that there had been no substantial evidence of an explosion, and that the experimental evidence had been improperly admitted at the trial.





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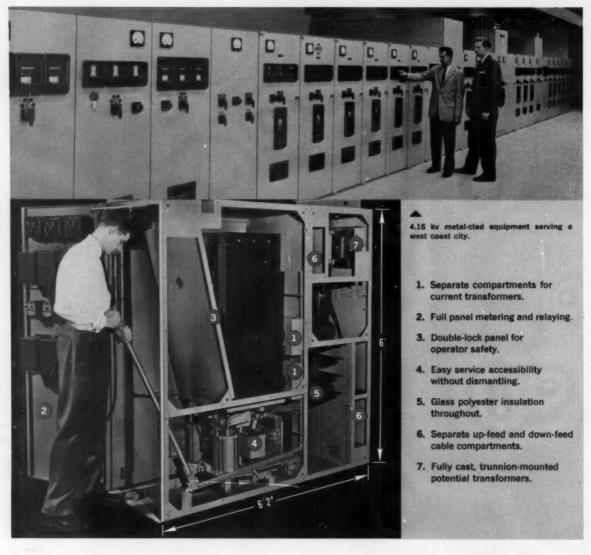
|   | SpaceMaker<br>Controller | Controller "A"  | Controller            |  |
|---|--------------------------|-----------------|-----------------------|--|
| Two starters in 90" height                                    | Yes                      | No              | No                    |  |
| Drawout construction  | Complete                 | Partial         | No                    |  |
| Simultaneously disconnects all six main leads (line and load) | Yes                      | Line<br>Only    | Line<br>Only          |  |
| Automatic shutters isolate line                               | Yes                      | Yes             | No                    |  |
| "No-tool" inspection of contacts                              | Yes                      | No              | No                    |  |
| Track-resistant, flame-retardant insulation                   | Yes                      | No              | No<br>Single<br>Break |  |
| Contactor construction  | Double<br>Break          | Single<br>Break |                       |  |
| Overload relays visible from outside                          | Yes                      | No              |                       |  |

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#### **Relations with Government**

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Harold P. King, of Sherman Oaks, California, president of the Consulting Engineers Council, expressed complete confidence that the Coordinating Committee on Relations of Engineers in Private Practice with Government wrote a chapter of progress in a recent conference in the nation's capital.

The Coordinating Committee had a luncheon meeting with representatives of various agencies of the United States government at Washington's Cosmos Club as September came to a close. The Committee presented its important policy "Position Paper."

The conference was designed to coordinate efforts of the represented organizations in developing "unassailable facts and sound policies for use of engineers and architects in private practice on public works" financed by local, state, or national government.

### The Word From

EDGAR A. POE CE Correspondent

Government representatives included officials of the Bureau of Public Roads, Bureau of Reclamation, the Navy's Bureau of Yards and Docks, U. S. Air Force, Army Corps of Engineers, General Services Administration, and International Cooperation Administration.

Hueston M. Smith, of St. Louis, past president of the Consulting Engineers Council, expressed the belief that the conference was good for all concerned. He asserted that the "climate is improving" in the relations of engineers in private practice with Federal government agencies. Past President Smith was a member of the Coordinating Committee.

In addition to King and Smith, others participating in the Washington pow-wow included James P. Exum, the chairman of the Coordinating Committee and a representative of the American Institute of Consulting

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BREAKAGE

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BROKEN

(x 106)

# Washington

engineers; Maurice M. Quade, New York, chairman of the Committee on Engineering Services of the American Road Builders' Association; Mason G. Lockwood, of Houston, past president of the American Society of Civil Engineers; G. J. Requardt, Baltimore, ASCE; John Reutter, Camden, New Jersey, chairman of the private enterprise committee of CEC; and Lyle W. Jones, Washington representative of CEC.

#### **Concrete Aggregate Selection**

A unique mathematical method for determining the most economical combinations of aggregates for various types of concrete has been reported.

The Highway Research Board in the nation's capital describes the procedure in a new bulletin (\$1.40 per copy.) Professor Charles Sargent, of the University

of Alaska's department of civil engineering, maintains that his method will enable the engineer to make economic selections and thus provide the best results.

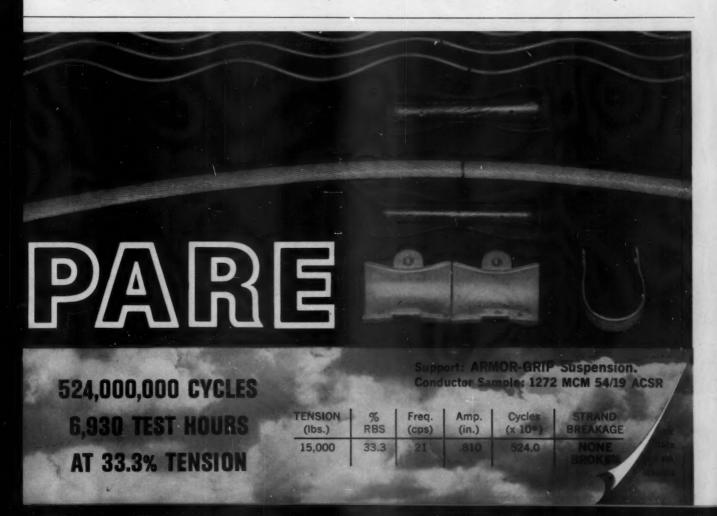
#### **Grand Coulee's New Administrator**

Grand Coulee dam, the world's largest concrete structure, has a new power supervisor. Erick A. Benson, a native of Wetaskiwin, Alberta, Canada, and an engineering graduate of Montana State College, succeeds A. F. Darland, who retired recently after reaching the mandatory retirement age of 70.

Grand Coulee dam, under the jurisdiction of the Bureau of Reclamation, has a 1,974,000-kw capacity hydroplant — the largest generating facility now in operation in the Western World. The multipurpose dam is a key structure of the Columbia River Basin reclamation project which supplies water to dry land in Central Washington state. The project has an ultimate irrigable area of more than 1 million acres.

#### **Improved Plumbing Standards**

A Bureau of Standards study pertaining to the mechanics of flow in main vertical plumbing drains and vents in buildings provides useful information designed to prevent oversizing of pipes. The aim was to develop criteria which would provide pipes adequate to carry maximum expected loads at minimum size and cost. The research has resulted in a number of equa-



tions, tables, and charts to compute pipe dimensions, and provide ample but not excessive drains and vents.

The Bureau of Standards' "Technical News" bulletin states that lack of adequate knowledge of hydraulics and pneumatics of building drainage systems is a serious handicap to the authors of plumbing codes and design handbooks. A review of municipal plumbing codes showed requirements differ as much as ninefold in fixture unit loadings for drainage stacks.

#### Government Engineer's Pay

Under existing law, the Civil Service Commission can authorize premium salaries for shortage category workers. However, qualified observers in Washington say that any decision on the proposed pay increases would have to be cleared by the White House. The fast growing National Aeronautics and Space Administration is the only agency that is making an all-out effort to get pay increases. The agency is seeking to get engineers and scientists raised to the top grades.

#### The Water Power Picture

The Federal Power Commission reports that about 95.3 million kilowatts of potential hydroelectric power was available for possible development in the United States as of last year. This undeveloped capacity would have an average annual generation of about 361.7 billion kilowatt hours.

Fifty-six percent, or about 53.6 million kilowatts, was in river basins west of the Continental Divide, 33,187,000 kilowatts of this in the Columbia River Basin. The Columbia River, with its tributaries, had the largest amount of undeveloped power of any river system in the country.

Included in the undeveloped potential is about 11.8 million kilowatts of capacity which was under construction on January 1, 1960. Also included is the U. S. share (150,000 kilowatts) of the power that could be developed at the potential Passamaquoddy tidal power project in Maine and New Brunswick. The estimates of undeveloped water power include projects on which engineering and economic feasibility have been demonstrated, as well as project sites where physical conditions indicate engineering feasibility and promise of economic feasibility at some time.

Fifty-one percent of the developed hydroelectric power in the U. S. was west of the sunset Rockies last year. Only Mississippi and Louisiana had no developed hydroelectric capacity. The report could have pointed out that more fresh water flows through Louisiana than any other state in the nation.

#### At the World Bank

There is increasing activity each month at the World Bank and its new affiliate, the International Development Association (IDA). Incidentally, the Bank has

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TEST DATA ON OTHER SIDE completed its 15th year of operations and is playing a vital role in the accelerated program of financial and technical assistance to the less developed countries.

Some recent World Bank and IDA actions include: a loan, equivalent to \$3 million, to the Central Bank of Costa Rica, to assist a program for the importation of equipment for the development of private industry in Costa Rica; a development credit amounting to the equivalent of \$4.4 million to the Republic of China, to help finance the expansion and improvement of water facilities in Taipei, the capital of Taiwan, and suburban communities; a development credit of \$6 million to India, for the expansion of tubewell irrigation in the State of Utter Pradesh.

#### Saving Nile Art

Now that Egyptian president Nasser appears certain to go ahead with his plans for the Aswan High Dam, the United Nations Educational, Scientific, and Cultural Organization has increased efforts to raise money to preserve the art and archeological treasures that will be flooded by the rising waters. The U. S. has been asked for \$10 million; Congress recently voted \$4 million for the fund.

#### Hannibal Locks and Dam

Army Engineers have approved construction of the Hannibal Locks and Dam, near Hannibal, Ohio. The project will cost an estimated \$56,891,000. However, work will not start until Congress specifically appropriates funds for planning and construction. Hannibal Locks and Dam is a unit in a \$1.2 billion, 20-year modernization of existing locks and dams on the Ohio.

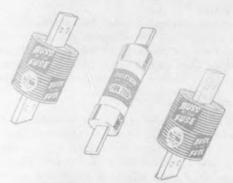
#### Morrow Point Dam

The Bureau of Reclamation plans to establish a field engineering office at Montrose, California, for the Morrow Point Dam and power plant to be constructed on the Gunnison River in Western Colorado. Morrow Point Dam will be a 405-ft high concrete arch structure. Construction will start early in 1962. Bureau of Reclamation says current studies indicate an installed generating capacity exceeding 40,000 kilowatts for the power plant. The dam site is 20 miles east of Montrose and 45 miles west of Gunnison.

#### **Pacific Northwest Study**

A committee of 26 Pacific Northwest leaders, to work with the Bonneville Power Administration in conducting a two-year study of basic resources and potential industrial growth of the area, was announced by Interior Secretary Stewart L. Udall. The appointees include representatives of state planning and development departments of the region. They will make an intensive study of selected industries on the basis of their present or potential importance.





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Electricity heats, lights, pumps water, cooks and operates all motor driven equipment in the West Utica and the Ewell Elementary Schools. No other utility service is used except the telephone.

The complete use of electrical energy puts special emphasis on the need to use the safest, most modern protective devices throughout the electrical system.

In each school, the main switchboard is protected by 3—1600 ampere BUSS Hi-Cap fuses having an interrupting rating of 200,000 amps. rms symmetrical. Thus, safe interruption of fault currents now available is assured,—and the fuses are adequately safe to allow for future system growth,

If a high fault current should occur, the fast opening characteristics of BUSS Hi-Cap fuses further protect the circuits and equipment against damage by restricting let-thru fault currents to safe value.

Feeder and branch circuit protection

To provide the safest short-circuit and overload protection... and to prevent needless outages,—FUSETRON dual-element fuses are used in the feeders and branch circuits of these schools.

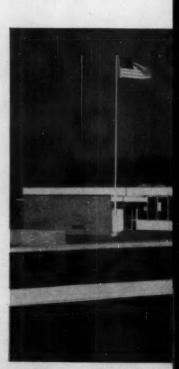
For modern, all-purpose protection of circuits up to 600 amps., FUSETRON fuses cannot be equalled. They have 100,000 amp. interrupting capacity,—and sufficient time-lag to hold harmless overloads.

For more information on

FUSETRON dual-element fuses
... write for bulletin FIS

BUSS Hi-Cap fuses
...write for bulletin HCS

BUSSMANN MFG. DIVISION, McGraw-Edison Co. St. Louis 7, Mo.





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Ewell Elementary School
GILBERT & KERNER
Utica, Michigan
West Utica School

West Utica School
CHISSUS CONSTRUCTION CO.
Birmingham, Michigan

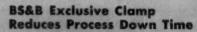
Switchboards protected by BUSS Hi-Cap and FUSETRON dual-element fuses.

WEST UTICA SCHOOL

NOVEMBER 1961

47

961



Some control valves last for years; others need frequent servicing to change out the inner valve and other internals; or to clean out the flow line. When this happens, extra time for shut-down of a process becomes economically critical.

How much time will the clamp ring save? It varies, of course, but you might ask the man who has changed out the trim on a six or eight inch valve. The time saved will be in hours! The two studs on the clamp ring are in sharp contrast to the many studs necessary to contain a flanged closure.

Concentricity and vertical alignment of valve internals is enhanced by the angular seating surfaces of the clamp ring. Some buyers are using this valve based on this feature alone. And, why not? This valve costs no more. Its servicing advantages to the buyer is an added premium.

If servicing valves can create a problem for you, we suggest you contact your BS&B representative and ask about valves with clamp ring closures, or write: Black, Sivalls & Bryson, Inc., 7500 E. 12th Street, Kansas City, Missouri.

how much is an howr worth?



BSB

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## Heard Around Headquarters

MARJORIE ODEN,

Eastern Editor

#### **New Professional Association**

A New York State group, patterned after the Michigan Association of the Professions, is being formed with Dr. Henry I. Fineberg as president pro tem. A constitution and bylaws are being drafted. The members are engineers, veterinarians, pharmacists, physicians, architects, and dentists. The New York State Bar Association also has been invited to join.

#### Architects' Reciprocal Registration

The American Institute of Architects was notified this year that—for the first time—all State Registration Boards would recognize certificates issued by the National Council of Architectural Registration Boards. This is an organization, similar to the National Bureau of Engineering Registration, which was organized for the purpose of obtaining reciprocal registration.

This month preliminary work begins on a new system of reviewing and renewing NCARB certificates. By January, the new system will go into effect.

Architects holding NCARB certificates are requested to submit an affidavit containing such information as is necessary for continuing their certificates. New affidavits must be submitted each year, along with a \$10 renewal fee.

NCARB then will make periodic reviews (at least every five years) of certificate holders' qualifications. Annual lists of approved certificate owners then will be distributed to all state boards.

Although all states now recognize NCARB certificates, this does not mean reciprocal registration is automatic. Some boards impose various additional requirements.

Even so, the architects are ahead of the engineers. At last report three states (Alaska, California, and Washington) stated they do not recognize National Bureau of Engineering Registration certificates. The other state boards accept the engineering certificates with varying degrees of qualification.

#### Can Use Consultants

In the past, the Ohio Highway Department was not allowed by law

to use consulting engineers except on primary routes outside of cities. The law now has been amended to allow the use of consultants for design of all primary highway routes with costs exceeding \$1 million.

#### No Scandal Story

There was widespread rumor that Reader's Digest had scheduled a sequel to its "highway scandal" based on the Blatnik investigations.

Last year, after complaints from the American Institute of Consulting Engineers and the National Society of Professional Engineers, Reader's Digest had indicated the possibility of running a second story—not so critical of consulting engineers. Then came the rumors that the highway story this year would have been similar to the



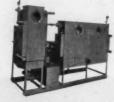
Left-right: R. Johnston, Structural Engineers Assn. of Southern Cal.; Col. A. Frye, Army Engineers; Capt. W. Wright, Soc. Am. Military Engineers; and S. Nelson, ASCE, Frye was guest speaker at joint SEASC-SAME-ASCE meeting.

# frost-free cooling as cold as -90 F

Consulting firms are more and more taking advantage of Kathabar engineers' specialized knowledge about frost-free cooling at sub-freezing dry bulbs and dew points. This knowledge has been accumulated in many successful applications—such as candy cooling, photo film chilling, beer fermentation, ammonium nitrate processing, environmental testing, bakery dipping and icing, and radiant panel cooling.

In all cases, Kathabar equipment eliminates freeze-ups, fluctuating efficiency, defrosting shutdowns, duplicate sets of coils. Take advantage of Kathabar's fund of specialized knowledge...

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| a division of Midland-Ross Corporation                         | MA           |
| Send facts on frost-free cooling for the following application | k            |
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| street   |              |
| cityzonestate  |              |

first article. The latest word is that there will not be any story at all.

#### **Directory Success**

For years, engineers in the New York City area have tried to get state or telephone company officials to police yellow page "engineer" listings — with no success.

Recently, they tried a new tactic which worked. The Reuben H. Donnelley Corporation, which handles yellow page listings, sent copies of a letter from the New York State Society of Professional Engineers Ethics Committee to 170 questionable "engineers." The letter pointed out that NYSSPE, the National Society of Professional Engineers, the Consulting Engineers Council, the American Society of Civil Engineers, the New York State Association of Consulting Engineers, and the New York Association of Consulting Engineers have passed resolutions condemning the listing of unlicensed "engineers."

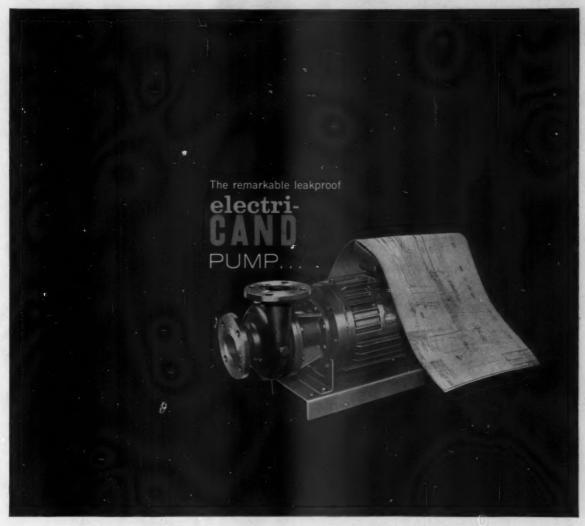
Charles Wurmfeld, ethics committee chairman, said that out of 170 letters sent, 75 persons have replied by asking to have their names removed from the engineer listings. "It seems there are many honest people around who did not know of our objections to unlicensed persons being listed as engineers," Wurmfeld commented. "We already have had 75 people cooperate, and mail is still coming."

#### Reminder of Law

The New York State Society of Professional Engineers has proposed that the State Chapter of the American Institute of Architects cooperate on a program to acquaint people with the state laws. The proposal is that placards — explaining the legal requirement of a seal (and signature) of a registered architect or engineer — be provided for agencies where plans are filed.

#### National Academy of Engineering?

A proposal that Engineers Joint Council back the idea of a National Academy of Engineering, to be es-



To give more value, pumps and motors are designed together . . .

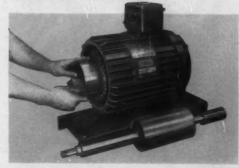
#### built under the same roof

Specify satisfaction . . . recommend *Electri-Cand* leakproof pumps to handle "unpumpable" liquids safely. They're products of Allis-Chalmers combined skill in building pumps *and* motors. A-C designs both major components in integral horsepower sizes to work well together . . . carefully integrates them for absolute leakproof performance, for maximum reliability.

'Electri-Cand pumps handle practically any solids-free solution: precious liquids, corrosives, toxic fluids, volatile compounds. As for safety . . . Electri-Cand pumps rated up to 91 psi are UL approved for Class I, Group D hazardous locations — nearly twice the approved rating of any other "canned" pump.

Removable, straight can design simplifies field inspection and maintenance. Choice of non-metallic sleeve type of *Fluid Piston* bearings . . . tailored to application. Bearings take care of themselves . . . are lubricated by the pumped liquid.

Specify efficient, safe handling of "problem" liquids. See your A-C representative about Electri-Cand pumps. Or write to Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.



Another Electric-Cand pump exclusive: removable, reusable sealing cans. In the event of stator failure, simple maintenance procedure is to repair the stator and reuse the original "can." Saves trouble; saves time; speeds pumps back to service. Electri-Cand and Fluid Pitton era Allis-Tohlemers tredemerks.

**ALLIS-CHALMERS** 



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tablished parallel to and cooperative with the National Academy of Science, is expected to be presented to the EJC board.

Engineers favoring the proposal have contended for some time that such government assignments as a national resources study could better be handled by a representative group of engineers than by scientists in NAS. Their aim is to get the Engineering Academy chartered by Congress, as is NAS, to be available on an advisory basis to government agencies. The original proposal is that the formative NAE be organized by five NAS members and seven appointed by EJC.

The engineers expect cooperation from NAS.

#### **Metallurgical Fellow**

The American Institute of Mining, Metallurgical, and Petroleum Engineers has granted permission to the Metallurgical Society to establish a Fellow membership grade. The first group of 20 will be named before the end of the year.

A Fellow will be an AIME member who has "won recognition for outstanding or notable contributions in some phase of metallurgy." He also "must have attained distinction as an eminent authority in some aspect of the broad field of metallurgy."

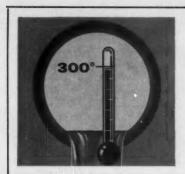
A maximum of 100 living Fellows has been set, with no more than five to be named per year.

#### **Check Draft Status**

In view of increasing monthly draft calls, the Engineering Manpower Commission has suggested employers might like to take another look at the draft status of employees — including those in Reserves.

Ready Reservists are available immediately for service upon call. With Stand-By Reservists their susceptibility to call depends on: I-R, available, II-R, deferred for occupational reasons; III-R, deferred for dependency; IV-R, status undetermined. "It may be assumed that Stand-By Reservists classified in

CONSULTING ENGINEER



#### PROTECTION . . . THAT REALLY WORKS

If you've ever had a pipe deteriorate, you know how serious it can be. Fibercast stands up where others simply won't do. Produced under a carefully controlled manufacturing process, its solid centrifugally cast walls provide positive protection against high temperatures in corrosive environments.

# FIBERCAST® epoxy pipe safely handles corrosive solutions to 300° temperatures

Rugged pipe carries 94% of known corrosive solutions. Available now in sizes from 2" to 8"

Heat and corrosion failures cost money. That's why it's important to consider the maximum protection you get with Fibercast epoxy pipe. Protection against premature fouling, generally attributed to operating temperatures and corrosive solutions. Protection against intermittent replacements, downtime—added costs for new materials and labor.

Years of actual operation in field use, prove Fibercast outlasts other kinds of pipe. Even more expensive metal pipe, or pipe with thermoplastic interior coatings cannot match Fibercast's resin rich interior.

#### Comparative Life Data

Report after report shows that Fibercast does outperform other types of pipe in terms of long service life. Basing Fibercast Grade J at 100% as unit life, comparable ratings show: Aluminum, 26%. Brass (RED), 74%. Rubber Hose, 21%. Stainless Steel (304-40), 31.1% Asbestos (cement C-100), 23.7%.

#### Handles 94% of Known Corrosive Chemical Solutions

Out of 338 common corrosive solutions, Fibercast safely handles 320. Not only does it provide superior resistance to corrosion, heat and pressure—it also has the outstanding ability to maintain the purity of the solutions it carries. The pipe has a glass-smooth interior with a Hazen-Williams C-Flow Factor of 147. This cuts friction losses. Encourages flow at intended pressures. Resists deposit

build-up. Dielectric properties ward off electrolytic action.

Fibercast owes its long life—and its special resistance to heat, pressure, corrosion, contamination, electrolytic action—to the exclusive way it is built. Fibercast is a centrifugally cast thermoset epoxy resin reinforced pipe with multiple layers of seamless braided glass fiber sleeving or especially woven glass fabric. Its body of woven glass fibers, impregnated with epoxy



FIELD USE PROVES RESISTANCE TO COR-ROSION . . . 1 Plastic-coated steel nipple (right), used in salt water supply well, corroded and lost strength after 3 months. Fibercast (left), used in same installation for 3 years still shows no loss of strength.

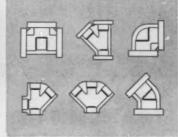
resin chemically cured at elevated temperatures provides remarkable ability to withstand high pressure and temperature in corrosive environments.

#### Savings Right from the Start

Fibercast puts you way ahead for your money from time of installation. Light weight makes it easy to handle; (it is one-fourth the weight of steel). Yet it even has structural stability and strength for installation on span racks with the normal metal pipe spacing.

#### Complete Line of Fittings

Fibercast offers fittings to solve any fitting problem. Besides a vast stock of standard sizes and types, Fibercast also designs and makes special fitting to meet individual problems. All have the same corrosion resistance properties of Fibercast Pipe and Tubing.



Get the full story on Fibercast Pipe, Tubing and Fittings. Find out how they can help you solve and combat specific problems relating to temperature, pressure and corrosion. Mail coupon today.

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Please send me, without obligation,

further details about Fibercast Pipe,

Tubing and Fittings.

Category I-R or IV-R are subject to immediate call," EMC added.

#### **Expense Deductions**

The Bureau of Internal Revenue has issued a statement that "While it is true that we have intensified our audit activity in the travel and entertainment expense area, there has been no change in the concept of what constitutes a deductible expense. Those expenses which are clearly shown to be for business

purposes will continue to be allowable under existing law. . . . [In recent investigations, any disallowances were for] wives' and childrens' expenses, expenses of side trips, vacations purported to be business trips, and for lack of substantiation of expenses incurred."

#### **Government Prospects**

For some time, the Commerce Department has been publishing the SYNOPSIS, a daily listing of forth-

coming government projects which would interest businessmen.

Now the General Services Administration is cooperating with the Commerce Department to give more timely data on Federal construction programs.

Included in the SYNOPSIS now are the names and addresses of architectural firms selected by GSA to design Federal projects. A spokesman for GSA said the government is hoping to get the information published early enough to be of possible use to consulting engineers. "Although I assume many architects have established working contacts with their favorite consulting engineering firms, other engineers can have the opportunity of presenting their qualifications to an architect almost as soon as he gets the design contract."

#### The British Arrive

For the first time in half a century, the Iron and Steel Institute of London has held a meeting in the United States. After joining the American Society of Metals, and the Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers for conventions in Detroit, the British delegation now is on a tour of Washington, D.C., and of the Midwest.

After a successful meeting in the United States in 1904, the British Institute had planned to come here again in 1938, but the trip was cancelled at the time of Munich.

#### **Research Duplication**

At the annual meeting of the American Society of Mechanical Engineers in New York City this month, President William H. Byrne is going to make another plea for pooling of basic research efforts. He already has presented his ideas on research to the Petroleum and Power Conference of the Society.

"By eliminating, at least to some degree, the duplication and secrecy in research, we would be multiplying the effectiveness of a valuable



An Autocall-Howe plant protection and monitoring system can provide positive control over all areas of a plant and insure the proper functioning of much of its equipment. Any physical change can be instantly detected, signaled and recorded as a printed message (in plain English) for prompt, corrective action. Nerve ends are the automatic code-signaling transmitters operating in conjunction with any type of sensing device. Nerve center is the Autocall-Howe Control Center with complete supervision and communication facilities. Systems can supervise; watchman reporting, automatic sprinkler systems, fire alarm, illegal entry, critical temperature and pressure conditions, high

and low water level, heating, ventilating, pump or valve operation, loss of power . . . and in addition, provide essential monitoring of many production functions.

Savings far exceed investment . . . and today hundreds of the nation's most modern plants have this advanced protection. For complete information contact your nearest Autocall sales office or write: The Autocall Company, Shelby 4, Ohio.

Autocall PLANT PROTECTION AND SUPERVISION

it's the finish that counts!

# GUTH ACRYLIC LIGHTING FIXTURE FINISH

stays whiter and cleaner longer



Unless you specify acrylic-base finish for your fluorescent fixtures (at no extra cost!), you are handicapped like a racer with brakes on.

Brilliant Acrylic finish always looks like new. It stays sparkling white longer — is easier to clean (dirt and dust can't embed itself in this 175% harder finish) — is tougher and resists to chipping and scratching — and discolors less when exposed to ultraviolet.

Take a look at the chart below . . . and you'll always specify Acrylic finish for fluorescent fixtures. Don't be satisfied with less when you can have something twice as good — AT NO EXTRA COST!

THE EDWIN F. GUTH CO. 2615 Washington Blvd. Box 7079, St. Louis 77, Mo.

GOOD QUALITY FINISHES

NEW GUTH ACRYLIC FINISH

PERCENT BETTER

| A    | Adhesion<br>To Metal | Humidity<br>Resist. | Sait<br>Spray<br>Resist. |        | Resist.<br>Tohacco<br>Smoke | Stain<br>Resist. | Grease<br>Resist. | Hard-<br>ness | Mar<br>Resist. | Reoper-<br>ated<br>Adhesion                | Baking<br>Color<br>Stability |        | Celer Rese<br>Exposed to<br>Ultraviole |
|------|----------------------|---------------------|--------------------------|--------|-----------------------------|------------------|-------------------|---------------|----------------|--|------------------------------|--------|--|
| Ä    | 8.0                  | 8.5                 | 0.5                      | 7.5    | 6.5                         | 5.0              | 7.0               | 8.0           | 8.5            | 8.5  | 7.5                          | 5.0    | 8.0                                    |
| 編    | 9.5                  | 10.0                | 9.5                      | 8.5    | 9.0                         | 9.0              | 10.0              | 22.0          | 9.5            | 16.0                                       | 8.5                          | 9.0    | 9.0                                    |
|      | 18.75%               | 17.65%              | 11.78%                   | 13.33% | 38.46%                      | 80.00%           | 42.88%            | 175.00%       | 11.78%         | 17.68%                                     | 13.33%                       | 80.00% | 58.00%                                 |
| 5000 |                      | No.                 |                          | 10900  |                             |                  |                   |               | NAME OF        | Per la |                              |        |  |

NOVEMBER 1961

resource — the time of skilled men." He added that figures showing the number of research scientists and engineers at work in the United States and in Russia fail to take into account duplication of efforts.

"Why have five companies spending \$10,000 each on the same research project when they could have a much more effective program for \$50,000?"

In his suggestion that duplication be eliminated, Byrne is urging the use of the research clearing house in ASME. "While we could not handle projects involving competitive advantage, we could offer impartial administration of pooled industry efforts." Byrne said the American Institute of Electrical Engineers has a similar research clearing house.

#### **Meeting Forecast**

Members of the American Society of Mechanical Engineers, attending

the annual meeting this month in New York City, are likely to find themselves discussing:

A proposal that, as of January 1, 1964, registration will be necessary for full ASME membership. This

¶ A proposal that, as of January 1, 1964, registration will be necessary for full ASME membership. This action, proposed as a facet of the AIEE-ASME-NSPE plan for unity, would not affect present members. ¶ A suggestion that O. B. Scherer have his title changed from "secretary" to "executive director and secretary." With the title change would go increased responsibility. ¶ A plan to have the role of the president of ASME restudied.

¶ Efforts to improve ASME communications, particularly on a member-staff level.

Most of these proposals are a result of the management consultant study ASME recently received.

#### **ASEE Award to Newmark**

Dr. Nathan Newmark, professor and head of the department of civil engineering at the University of Illinois, has received the 1961 Vincent Bendix Award from the American Society of Engineering Education. The award was made at the ASEE annual meeting at the University of Kentucky.

Dr. Newmark was cited for his "outstanding contributions in research," and for "leadership in developing a great research facility."

#### **Air Conditioning Seminar**

The Producers' Council has prepared a seminar on air conditioning, designed specifically for architects. By means of film, records, and panel discussion, the seminar tries to show the relationships of architecture to air conditioning.

The PC recommends that all mechanical consultants attend the seminar, which is to be presented in various cities throughout the country, and that the engineers get architects to attend also. Additional information on the seminars is available from the local chapters of PC, or from Producers' Council, Inc., 2029 K Street, N.W., Washington 6, D.C.



ron and corrosive, odorous gases cause red water, leaky pipes and clogged meters. Unless corrected, these problems will result in loss of revenue, and consumer complaints.

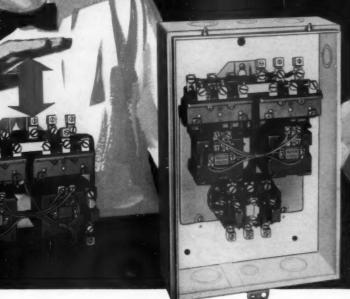
GFC Forced Draft Aerators and Filters can solve these problems. They are designed for easy assembly, dependability and long life.

Ask about our new aluminum and fiberglas Aerators. Write for your copy of our new Aerator and Filter Plant bulletins with design data and problem analyses.



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### How's this for SATISFYING YOUR REVERSING SWITCH PROBLEMS!





BULLETIN 705 SIZE 2 Reversing Starters.—Available in Seven Sizes with Maximum Ratings up to 100 HP, 220 V; 200 HP, 440-550 V.

# Open or Enclosed—THEY SAVE SPACE WHERE IT COUNTS MOST

Listen to this—all new "open type" A-B reversing switches have the overload relays mounted at the sides as shown—ideal construction for panel channel wiring. It fits with A-B contactors and starters of the same rating. The over-all width for each rating is also appreciably less than it was with the old Bulletin 705.

All new enclosed A-B reversing switches have the overload relays (either 2 or 3) mounted as a "block" below the reversing switch. This permits a narrow enclosure—ideal for most mountings on machine tools.

Rating for rating, the new Allen-Bradley reversing starters will set new records for long, trouble-free life. The new structure is so simple and so sturdy that nothing can go wrong. If you have a particularly tough service application, try the new A-B Series K reversing switches—and live happily ever after.

You'll like the new line of modern, attractive enclosures, too. Brooks Stevens, internationally known industrial designer, has given them that extra "eye appeal"—which is an asset for every installation.

For complete information on these new reversing switches, please write today for Publication 6100, Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wisconsin,



Size 1 Combination Reversing Starter—available with fused or unfused manual disconnect switch, or as Bulletin 707 with circuit breaker.

17-61-MR

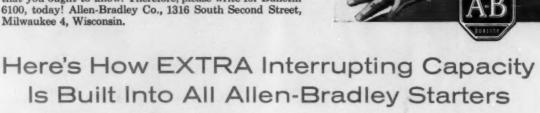
ALLEN-BRADLEY

QUALITY MOTOR CONTROL

# The Superior "Quality" of the New Allen-Bradley Starters GREW OUT OF DESTRUCTIVE TESTS

Tests which subject starters to far more severe conditions than heavy-duty service are "routine" at Allen-Bradley and provide data for improved starter design

There was no question about the "quality" of the old Bulletin 709 starters but—the new line is far superior. With their built-in "extra" interrupting capacity, each rating of the revolutionary new Allen-Bradley motor starters can operate with ease at maximum rated capacity for prolonged periods—and still have more than ample reserve for emergency conditions. The new, totally enclosed arc hoods are hot molded of a material having unusual arc quenching properties. In addition, powerful arc blowouts and wrap-around metal quenchers assure fast, efficient arc extinction and heat dissipation. There are many other features about this new line that you ought to know. Therefore, please write for Bulletin 6100, today! Allen-Bradley Co., 1316 South Second Street, Milwaukee 4 Wisconsin.



#### Powerful Arc Blowout



The powerful magnetic field, generated between the contacts when an arc is drawn, forces the arc off the end of the contacts. It is quickly cooled and extinguished by the large surfaces of the hood.

#### **Totally Enclosed Chambers**



A new, unusually strong and stable material is hot molded to extremely close tolerances. Each chamber of the arc hood is totally enclosed. Thus, the usual effects of ionization and heat are greatly minimized.

#### Metal Arc Quenchers



Size 2 starters and the higher ratings have metal quenchers in both the front and back of each arc chamber. This efficient construction gives the arc no chance to become destructive,

17-61-MI

ALLEN-BRADLEY

QUALITY MOTOR CONTROL

## In a wet, cold, foreign country

... Gilsulate poured-in-place insulation and ... A leading prefabricated steel case piping insulation were tested under identical conditions

Here are the results... Gilsulate system was less than ½ the cost for the completed installation of the steam



and condensate return system.

Gilsulate system had 1/5 the heat loss.

Gilsulate resulted in greatly reduced maintenance costs. Leaks in piping can be easily located and repaired. GILSULATE requires no casing, which is subject to damage and corrosion, to keep it dry.

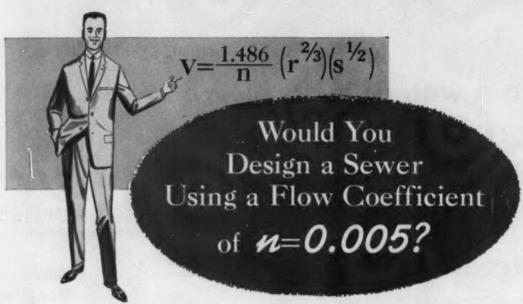
We will be pleased to send you technical information on GILSULATE insulation so you can evaluate the merits of this low-cost, poured-in-place material. Once you have learned the merits of GILSULATE, we feel certain you will want to write your "specs" to assure the use of GILSULATE... with engineer-supervised installation.

The insulation for superior protection of underground hot pipes



American Gilsonite Company | Municipal Airport P. O. Box 15 | Salt Lake City, Utah

Distributors in Principal Countries of the World



Of course not! Nor would any pipe manufacturer with the public interest in mind recommend it. Even though recent tests at the National Clay Pipe Manufacturers, Inc., Research Laboratories show that Vitrified Clay Pipe offers a coefficient this low, it would be highly misleading to base design recommendations on the results of these tests.

Under more favorable test conditions, it would be possible to bring the Clay Pipe "n" factor down even lower. But what would it prove? Certainly not that the Engineering Profession should abandon its own use-proved value of n=0.013 for n=0.005, for n=0.010, or for any other promotion-slanted value.

CSPA member companies believe the Engineering Profession itself is best qualified to determine the flow factor to be used in designing the nation's sewer systems.

Year after year, Clay Pipe retains its exceptional flow characteristics . . . does not change shape or deteriorate . . . is completely unaffected by the corrosive slime layer that builds up in ALL sanitary sewer lines. It is always sound economy to specify Clay Pipe—the one pipe with all the features you can trust.







CLAY SEWER PIPE ASSOCIATION, INC.

311 High-Long Building

5 E. Long St.

Columbus 15, Ohio

# The High Spots



#### Study - Formal

Consulting Engineer's Survey of the Profession in 1960 was "A Portrait of the Man at the Top," a study of the background and present status of the average man who heads a consulting engineering firm. One of the facts that emerged from the survey was that the University of Illinois turns out more graduates who go on to head their own firms than any other engineering school. MIT ranked a close second on the list.

A study by Dean W. L. Everitt, of Illinois, may point to the reason for this. His study showed that MIT and Illinois lead all other schools in the number of doctorate degrees awarded in engineering—Illinois leads in civil engineering, MIT in other fields. Of course, this brings up another question: Why do Illinois and MIT award more doctorates in engineering?

#### Study - Informal

The General Research and Development Division of Buchart-Horn, York, Pennsylvania consultants, recently held its first staff meeting in York. The purpose of the meeting was to discuss common problems in automation, hydraulics, pneumatics, computers, and other topics; those attending included consultants, educators, and research scientists from the Northeast.

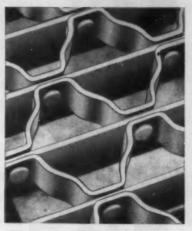
Although this was a limitedmembership discussion, we hope it is an indication that consultants are becoming more aware of the potential value of professional seminars for advanced problem discussion.

#### Air Pollution Control

¶ All of the more than 3500 cars owned by Los Angeles County will be equipped with a double crankcase emission control system which is reported to be 100 percent effective in preventing air pollution from this source. A test program run by the County showed that either of two systems is about 80 percent effective, and the combination, in addition to full efficiency, provides a stand-by in case one should fail. The basic differences in the systems is the discharge of crankcase emissions: one pipes them into the carburetor air cleaner, the other brings them into the intake manifold below the carburetor. The latter system is more expensive, because of the added cost of a valve to maintain manifold pressure.

The Air Pollution Research Laboratory at the University of California has announced discovery of a second smog compound which causes eye irritation and plant damage. The new substance, peroxypropional nitrate (PPN), is related to the only other known double-irritant in smog, peroxyacetyl nitrate (PAN). PPN and PAN are about equal in effect as eye irritants, but PPN causes considerably more damage to plants. PPN was

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"CK" Decking, successfully field-tested for 4 years, has the same advantages of safety, strength, durability and self-maintenance as standard Type V Decking

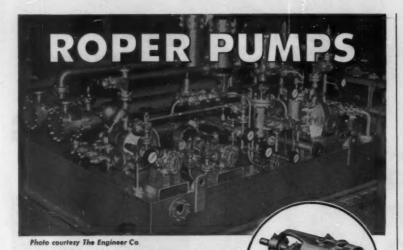
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The complex lube system for this centrifugal compressor was designed by The Engineer Co. for the Elliott Co. and Blaw-Knox for Ashland Oil Co., using two types of Roper pumps as booster and main lube units. The Fig. 1H15 booster pumps handle 70 SSU viscosity SAE-10 lube oil at operating temperatures of 140°F, and deliver up to 17 gpm at 475 psi pressure. The two main lube pumps are specially modified Roper Series K units handling 76 gpm at 50 psi. Close cooperation with The Engineer Co. by Roper determined the pumps which would best serve the needs of this lubricating system. Special problems involving pump components for your equipment will receive this same skilled assistance by Roper engineers.

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discovered after tests disclosed damage to plants in excess of that directly attributable to PAN.

¶ An industry committee in Pittsburgh and surrounding Allegheny County, Pennsylvania, has announced plans for a program to equip all open hearth and electric furnaces in the area with air cleaners. The program, expected to take about 10 years, will concentrate first on the open hearth furnaces, which are the industry's most troublesome air polluters.

#### **Lighting Cuts Tension**

A paper presented by D. E. Cleveland at the recent annual meeting of the Institute of Traffic Engineers was given the ITE Past Presidents' Award for research. Cleveland's paper showed that proper lighting of highway intersections can reduce driver tension by 20 percent.

The paper was based on a series of tests made near Houston, Texas. Test drivers, without being told what the test was for, were instructed to drive a prearranged night course which would take them through a series of lighted and unlighted intersections. Galvanometers were connected to each driver's left hand, to measure skin response indicating tension.

The results of the tests showed that 22 percent fewer tension responses were recorded in properly lighted intersections than in unlighted ones. In addition, the responses in the lighted zones were 22 percent weaker than those in the unlighted zones.

#### **CEC Speaker**

The featured speaker at this month's semiannual Consulting Engineers Council meeting in Miami Beach will be Richard Wagner, President of the U.S. Chamber of Commerce. Wagner, chairman of the executive committee of the Champlin Oil Company of Chicago, is a strong advocate of the private enterprise system. He is particularly well known for his views on tax reform and the need



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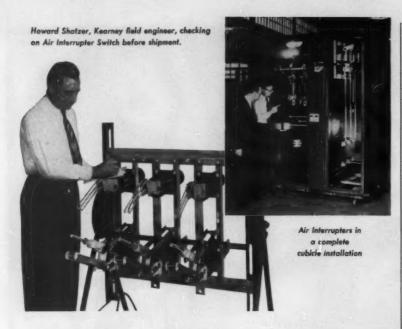
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Specify safety for personnel and equipment. No exposed Arc. Kearney Air Interrupter Switches will not produce external arcing dangerous to men or equipment.

Specify economy. Costing less than circuit breakers and with interrupting capacity not found in air break disconnects, Kearney Air Interrupters are ideal for . . . interrupting magnetizing charging current of transformers . . . interrupting charging current of lines and busses . . . interrupting exciting current of feeder regulators . . . interrupting load currents to rated capacity . . . sectionalizing feeders and distribution circuits.

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Write for Bulletin 152



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for additional measures to encourage capital investment in American industry.

#### **Structural Meeting**

Dr. Arthur Casagrande, Professor of Soil Mechanics and Foundation Engineering at Harvard, addressed the annual Northwest Conference of Structural Engineers in Seattle, Washington. Dr. Casagrande's topic was "Building Foundations on Soft Ground." The meeting was sponsored jointly by the Structural Engineer's Associations of Oregon and Washington.

#### **ACI Meeting**

Several prominent consulting engineers will be among the featured speakers at the 14th American Concrete Institute Regional Meeting this month in Birmingham, Alabama. During the three-day conference, papers will be presented by G. A. Heft, of New Orleans; R. H. Bryan, of Nashville; Lloyd Belcher and George Shalas, of Rust Engineering, Birmingham; Max Zar, of Sargent & Lundy, Chicago; and R. C. Elstner, of The Engineers Collaborative, Chicago.

#### ITE Resolutions

At its recent meeting in Washington, the Institute of Traffic Engineers adopted a number of resolutions pertaining to traffic control and safety:

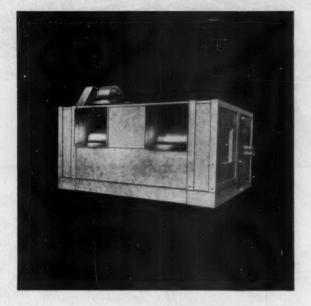
¶ That the governing body of every government unit be urged to implement and accelerate progress toward uniformity in the design and application of control devices, by legislative action.

That the ITE recommend the prompt utilization of significant traffic engineering research through revision of or supplement to the Manual of Uniform Traffic Control Devices, as approved by ITE

That the ITE continue its support of the Revised Action Program of the President's Committee for Traffic Safety, as an effective method of achieving greater safety in our highway system.

# All your air conditioning problems can be solved with one system...from one source

Carrier Central Station Weathermakers-over 50 possible arrangements

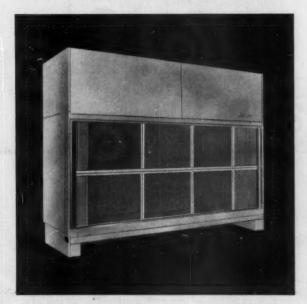


Shown here is the 39AC Weathermaker designed for single-zone applications. It features "building-block" design, which simplifies unit selection and location and permits over 50 different functional and physical arrangements. Choice of direct expansion or chilled water cooling coils; steam or hot water heating coils. Coil face velocities from 300 to 700 fpm; static pressures up to seven inches.

To meet the requirements of smaller conventional jobs, Carrier broadens its central station fan-coil line with three new sizes. In all, you now have a choice of eleven 39AC sizes from 1000 to 40,570 cfm.

The Carrier model 39W Multi-zone Weathermakers provide simultaneous independent cooling or heating in up to 14 different zones. Same sizes, coil face velocities and static pressure as the 39AC; cfm range from 2500 to 40.570.

#### Carrier Fan-Coil Weathermakers-versatile, economical applications



The 38R Weathermaker\* offers many advantages. It has a compact design, a flexible fan section to help simplify installation, and most sizes can be stationed in vertical or horizontal arrangements. Components are protected in an attractive bonderized cabinet.

To handle larger air conditioning jobs, Carrier has added two new sizes to its 38R Fan and Coil Direct Expansion line. You now have a wider choice for your requirements. Sizes now available will provide from 1500 to 25,000 cfm.

For summer cooling, 38R Weathermakers may be used with remote condensing unit or liquid chilling packages. Addition of steam or hot water coils convert them to year-round units. They may be used singly or in multiples. \* Res. U.S. Pat. Off.

For complete details about these products, see the Carrier dealer listed in the Yellow Pages. Or write to Carrier Air Conditioning Company, Syracuse 1, New York.



Carrier Air Conditioning Company

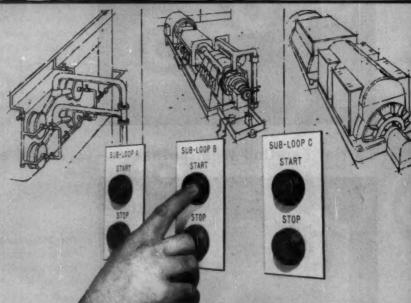
#### FIRST SIMPLIFY...

First step to automation is to simplify the information now presented by a multitude of multi-record charts, gages, and annunciator lights. The Bailey approach gives the operator data he needs (logged periodically), keeps continuous watch on all variables, makes calculations where required, alarms when trouble threatens. Reliability of recorded data is increased... operators can devote full attention to correcting off-normal conditions and improving operations.



#### NEXT VERIFY...

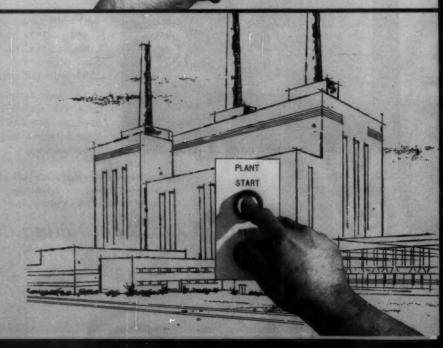
Next, verify the practicability of automation by extending supervisory controls, letting equipment perform more operating functions. Automate key systems, one at a time, by push-button controlled sub-loops. This approach smooths the transition to complete automation and improves safety to men and machinery by providing safe, uniform start-up, shut-down, and normal operating procedures.



# THEN

**AUTOMATE** 

Final steps to automation can then be made at any time with full confidence and proved operational experience. These steps are: 1) to consolidate supervisory controls, conventional controls, and sub-loops for full-range automatic operation once the plant has been placed on the line; and 2) ultimately, to add start-stop control to provide full automation.



# How to get assured results from AUTOMATION

... and gain as you go



Complete automation is a long step forward
— with many challenges along the way.

The Bailey step-by-step approach to automation makes possible step-by-step certainty ... provides step-by-step benefits ... requires only step-by-step commitment.

In the initial steps it makes possible many or most of the benefits of complete automation with considerably less investment than required for the ultimate. And it permits the decision to take each succeeding step to be made only after satisfactory evidence that it is economically justified and functionally sound.

Bailey 700 Systems draw on the best available techniques, including analog and digital manipulation, trend recording, time sharing,

scanning, alarming, calculating, controlling, and logging, as required to meet operating objectives. Individual systems, including logic and sequence units, are coordinated by Bailey's distinctive method of parallel programming to achieve plant automation. The parallel-programming approach improves plant availability by making it practical to remove individual systems from service or reprogram without disturbing operation.

Ask your Bailey District Office, or write for more information on the Bailey step-bystep approach to automation with Bailey 700 Systems. Bailey Meter Company, 1064 Ivanhoe Road, Cleveland 10, Ohio. In Canada —Bailey Meter Company Limited, Montreal.

#### Bailey Systems Concepts are Founded on 45 years of Experience



Twenty-one of the twenty-six most efficient steam-electric stations in the United States use Bailey Instruments and Controls.\* This reflects more than 45 years of Bailey developments devoted to improving the reliability of power-plant operation. \*Listed in Federal Power Commission Report S-145.



Bailey experience in automation dates from electrically operated boiler controls in 1924, automatic start of boiler controls on steam-electric locomotive in 1936, and fully automated package boilers in 1948. This Bailey 750 System for simplified display of power-plant operating information was installed in 1959.



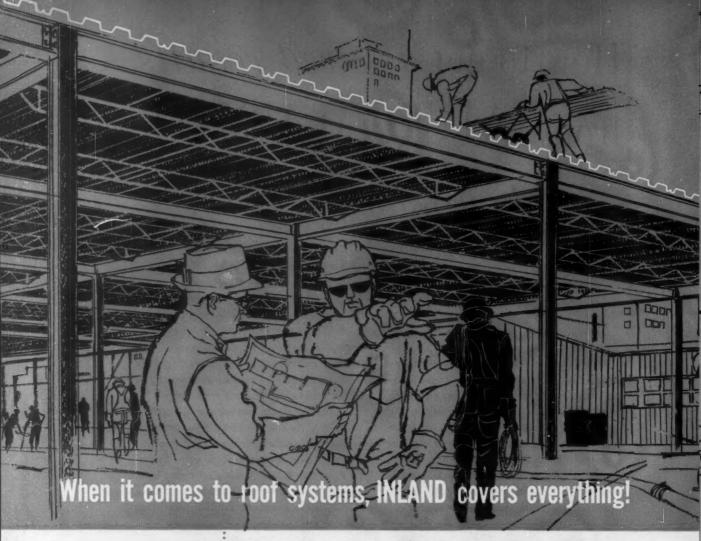
Bailey experience extends to and includes the atomic power field. In the completion of the Enrico Fermi Atomic Power Plant at Monroe, Mich. in 1961, Bailey Meter Company was prime instrument contractor, supplying both pneumatic and transistorized electronic control systems.

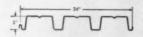
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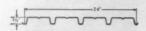
BAILEY METER COMPANY

700 Systems

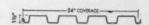




NEW! N-DECK—Available in lengths from 6'0" to 28'6". Carries normal roof loads over spans up to 16'0". Especially practical for canopies.



A-DECK — For puriln spacings not exceeding 8'4". Narrow ribs provide deck surface that supports the thinnest or softest types of insulation.



B-DECK — For spans to 10'0". Wide rib distributes metal for greater structural effic ancy. Well suited for use as side wall panels.



T-STEEL — Newl Galvanized only. For clear spans to 32'0". Adaptable to acoustical and flush, luminous ceiling treatments. Provides superior diaphragm to resist seismic and wind loads.



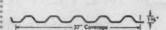
NEW! N-ACOUSTIDECK—Steel deck and acoustical ceiling in one panel. For spans to 16'0". Noise-Reduction Coefficient, .70.



H-DECK — New! For simple spans to 20'0" — 3" and 4½" depths. Especially practical to cover walk ways in shopping centers, schools, other installations. Also available in Acoustideck.



B-ACOUSTIDECK — Two-in-one panel combines steel roof deck with acoustical ceiling having Noise-Reduction Coefficient of .70. Used for spans to 10'0".



RIBFORM — High-tensile, galvanized steel form for concrete slabs over spans up to 8'0". Three types: Standard, Heavy-Duty, Super-Duty (shown), Whether your design calls for a dry insulation board roof or for wet-fill, there's an Inland roof system for the job — by the makers of famous Milcor steel building products.

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# Bituminous Piping Controversy

FHA, BRAB Disagree Over Report

MARJORIE ODEN, Eastern Editor



THE BUILDING RESEARCH Advisory



Board has found itself in the position of protecting "the public's right to know" on a residential building sewers report, pre-

pared at the request of the Federal Housing Administration. The FHA, on a nontechnical basis, objected to the report's statements on bi-

tuminous piping.

The BRAB and the committee which prepared the report (including a number of prominent consulting engineers) have maintained that they "will not change the Committee report; that it is a good and sound report; and that we are prepared to answer any questions that may be raised," according to a letter sent from BRAB headquarters explaining the situation to date. "To the best of our knowledge, the attack has come from the bituminous pipe industry. They have not been willing to debate the matter with us on the basis of the recommendations; or any other basis for that matter. Instead, they have chosen to attack the study method through FHA, claiming that neither time nor money was adequate to produce conclusive facts. We have repeatedly pointed out that money was available . . . and that the method was sound.

"We want [the committee members] to know that the Board has not and will not alter its position of supporting the Committee and its report."

#### **FHA Position**

FHA had received 1700 copies of the report, almost 300 copies had been sold by BRAB, and additional copies had been distributed to libraries. Then FHA asked that distribution be stopped, and BRAB cooperated. Later, FHA said the report could be circulated if it contained the following statement:

"The Federal Housing Administration has carefully studied BRAB Report No. 16, Residential Building Sewers. The Report contains rauch valuable information which has not previously been consolidated in a study report of this nature. However, because of certain inherent limitations of the study due to the scope and complexity of the problem, FHA believes the Report should not be accepted as a determination or evaluation of the merits and limitations of various types of sewer pipe material.

"FHA is particularly mindful of the reported ratings of pipe materials and jointing methods and the related limitations imposed in certain instances. FHA does not believe that this and other information contained in the Report justify changes in related FHA Minimum Property Standards, nor do we believe that there is indication of the need for a more rigorous FHA inspection procedure in one instance than in another."

BRAB objected to having to include this statement in the report, but later decided "recipients should be able to see the report and form their own opinion."

#### **Section in Question**

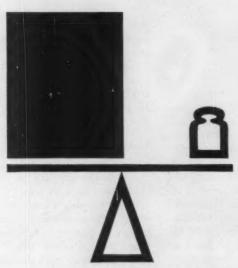
The only section of the 127-page report to which FHA or anyone else took exception was:

"The Advisory Committee considers bituminized-fiber pipe, and its joint coupling acceptable for house sewers when installed in strict accordance with the 'Instructions for Installation' of the Bituminous Pipe industry. Unless these instructions are carefully followed, the basic material is not considered structurally adequate for satisfactory performance over a period of approximately 50 years.

"Bituminized-fiber pipe and its fittings should meet standards of: (1) Commercial Standard CS116-54, and (2) Federal Specification SS-P-356. The Committee believes, however, that the laboratory procedures on which these standards are based cannot adequately simulate the performance of the pipe under extended service, taking into account the possibility of improper installation. The basic material exhibits the property of plastic cold flow to a greater degree

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Westinghouse dry-type transformers are the smallest, lightest and most versatile on the commercial market today. Easy handling and quick positioning mean low-cost installation.

You can mount Westinghouse Type EP transformers in any position—floor, wall or ceiling. Capsulated construction supports core and coils without bracing or ventilating ducts. Three-phase Type EPT is equally compact. Types DS-3 and DT-3 transformers are especially designed for minimum-space installation on floor, platform or trapeze mountings.

One source can meet all your dry-type transformer requirements. Call your Westinghouse representative—or write Westinghouse Electric Corporation, Pittsburgh 30, Pa. 3.70976

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than the other acceptable pipe materials. For this reason, care must be taken prior to installation to prevent distortion of pipe during hot weather, and special care must be exercised in the bedding and back-filling processes to prevent excessive deformation under long-term service.

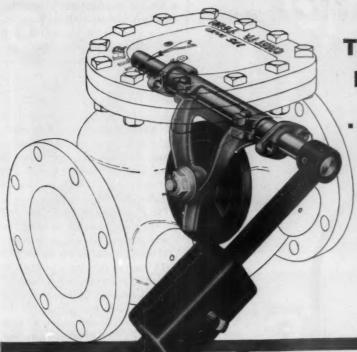
"The Committee recommends that FHA require the inspection of fiber-pipe house-sewer installations at two stages of construction to insure compliance with the manufacturer's recommendations. Inspection should be made (1) after the bedding is complete and the line constructed, and again (2) after backfill has been brought to the top of the pipe."

#### Recommendation

"Installations employing makeshift fittings or jointing methods should not be approved. In addition, FHA should recommend to manufacturers of bituminous-fiber pipe that the material and its joint coupling be improved in strength and in resistance to deformation to provide a greater factor of safety against failure, in light of the hazards and uncertain quality of many field installations. In addition, an adverse effect of high temperatures for long periods upon the durability of fiber pipe is suspected and should receive attention of the manufacturers. Satisfactory action by the industry on these points would lessen the need for the additional inspection recommended by the Committee.

"Bituminized-fiber pipe should not be used to extend the house sewer beyond the residential property lines to a curb or into a street or alley, unless protected by adequate street paving or encasement designed to withstand the maximum impact load that is likely to be encountered."

The Committee preparing this report had William Gillett, vice president of business planning, Fenestra Inc.; and Richard H. Tatlow III, president of Abbott-Merkt



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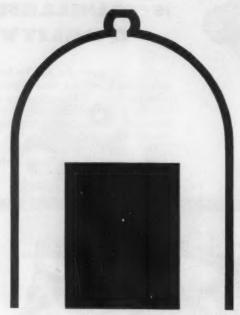


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You can mount Westinghouse Type EP transformers in any position — floor, wall or ceiling. Capsulated construction supports core and coils without bracing or ventilating ducts. Three-phase Type EPT is equally compact. Types DS-3 and DT-3 transformers are especially designed for minimum-space installation on floor, platform or trapeze mountings.

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& Co., as co-chairmen. Committee members included Alfred Jaros Jr., senior partner of Jaros, Baum & Bolles; and Philip C. Rutledge, partner, Moran, Proctor, Muesser & Rutledge.

#### **BRAB Position**

BRAB, formed at the request of the National Academy of Sciences and the National Research Council about 10 years ago, has done 15 prior reports for FHA and has had no trouble prior to "Residential Building Sewers."

On June 30, 1960, FHA granted BRAB permission to publish the sewer report, but asked "for several weeks' delay in release to give FHA time to develop a position in regard to the recommendations . "

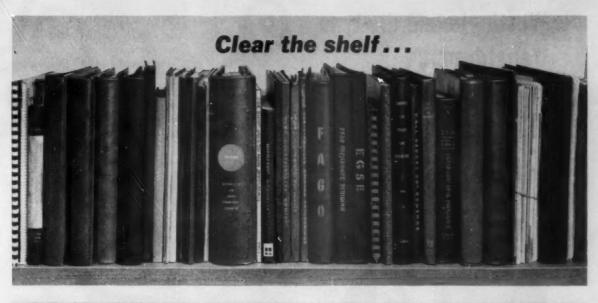
As Robert M. Dillon, executive director of BRAB, explained: "FHA asked for 1700 copies for its own use. Normally, it takes from one to three months to prepare a report of this size for publication. In this case, some 3000 copies were to be printed, so the delay asked for in no way inconvenienced us."

During the time the reports were printed, an FHA official sent mimeographed copies of the report and letters to various associations and companies. He cited "cold flow" and asked each addressee what his company intended to do about the deficiencies cited in the report. Dillon said that to the best of his knowledge, this was the first time industry had been contacted in this manner on a BRAB report.

#### **Circulation Stopped**

In November 1960, BRAB received the FHA request that distribution of the report be stopped. In January, Acting Commissioner of FHA, Norman P. Mason (on his last day in office) sent BRAB a letter commenting on a previous meeting with BRAB officials.

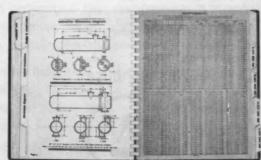
"On the occasion of this meeting, I expressed my conviction that the report undertook to establish factual data and make specific recommendations of a scope beyond





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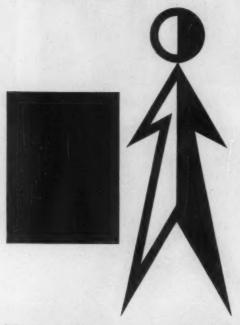




Richmond Engineering Company, Inc. 7TH & HOSPITAL STREETS, RICHMOND, VA.

## Westinghouse dry-type transformers

cut labor costs with factory-mounted circuit breakers



When you specify pre-mounted circuit breakers on Westinghouse dry-type transformers, the unit is delivered with the breaker completely wired to the transformer primary. No further connections are necessary. You save hours of labor, eliminate cable and conduit fittings.

You can mount Westinghouse Type EP transformers in any position — floor, wall or ceiling. Capsulated construction supports core and coils without bracing or ventilating ducts. Three-phase Type EPT is equally compact. Types DS-3 and DT-3 transformers are especially designed for minimum-space installation on floor, platform or trapeze mountings.

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You can be sure . . . if it's Westinghouse



that which should have been expected in consideration of the time and money allotted for the purpose. The nature of the problem made it necessary for the report to deal with controversial matters, and the limitations imposed made it necessary to use methods of data collection which seem to have been inadequate to definitely establish the facts.

"Therefore, I have determined that the report will not be used by FHA and I withdraw permission to BRAB to publish and distribute additional copies. It is agreed that FHA will reimburse BRAB for its cost of unsold copies."

At first, the committee considered an addendum, giving conditions under which a second inspection by FHA men of bituminous piping installations could be avoided. The addendum was prepared, and rejected on a technical basis.

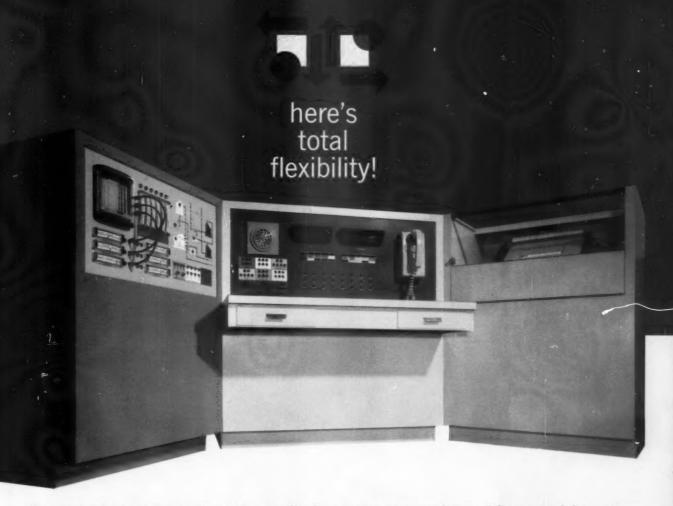
#### The New Regime

The new FHA Commissioner, Neal J. Hardy, wrote in May that BRAB could resume distribution of the report provided a stamp was placed on the front calling attention to the official FHA statement, which was to be placed inside the report.

NAS and BRAB objected to the wording of the required statement, and suggested instead that a statement be included pointing out that "The permission granted by the Federal Housing Administration to publish and distribute this advisory report does not in itself indicate acceptance of the conclusions or recommendations it contains."

The FHA would not back down from its original prepared statement, and the issue was deadlocked for the summer. At a recent meeting, BRAB voted to comply with the FHA request in order to resume distribution. "Failure to do this could only mean that the report would be further suppressed, and [users desiring it] . . . would have no basis for judgment," Dillon concluded.

# JOHNSON CONTROL CENTER MODULES



The most advanced development in centralized temperature control, new Johnson modular units permit complete flexibility in control center design and operation. They are adaptable to all transmission systems — pneumatic, electric, electronic.

Besides temperature control, many other functions, such as lighting control, power plant control, communications, and alarm systems, may be integrated into the center. The wide choice of features ranges from conventional data indication and control to automatic digital printing, closed-circuit TV, and screen-projected floor plans and system diagrams. You use as many or as few modules as you wish. Each module is custom-equipped.

Johnson Control Centers are ideal for both new and existing systems in commercial, industrial, and public buildings of any size. For examples of how these compact modular units can be combined to increase system efficiency and make more effective use of manpower, turn the page . . .



## Keyed to the Needs of the Individual Building...

Johnson Control Center Modules offer unmatched opportunities for systems efficiency and savings. Check the features of this typical grouping and see why.



#### MISCELLANEOUS DATA MODULE

Pneumatic indicating receivers, mounted horizontally or vertically, provide continuous indication of key temperatures and pressures. Integral switches indicate off-normal conditions. Optional recording of variables is provided by three-pen, plug-in recorder. Interlocked circuits provide automatic sequence motor control of refrigeration system. Visual indication of operation, manual override, and graphic diagram of the system are also included.



#### CONTROL CONSOLE

Contains digital clock, digital indication of variables, visual and audible alarms, and intercom system. Master switches determine mode of operation of digital indication and logging. Switches include master onoff, off-normal scan, all-point scan, point hold, scan locked out, printer locked out, off-normal alarm release, audible alarm release, audible alarm test. Centralized security checks and alarms can easily be included also.



#### DATA LOGGING MODULE

A high-speed, automatic digital printer provides the building engineer with a permanent record of control data. All off-normal values are printed in red; normal values are printed in black. With parallel print-out, all keys print simultaneously, thus speeding data collection. Logging rate is adjustable up to one point per second. Using Johnson modules, a single center can provide centralized supervision and control for as many as a dozen or more buildings!

### Johnson Modular Units Allow You to Centralize All Types of Systems Supervision and Control

#### AIR CONDITIONING - HEATING

Continuous visual indication of key temperatures, humidities, pressures, liquid levels, etc. Continuous or optional recording of variables. Automatic data logging of variables.

Boiler surveillance: steam, oil, and gas pressures: oil level: boiler alarms.

Manual or automatic start-stop controls for fans, pumps, and motors: indicator lights.

Remote sound or TV surveillance of fan room equipment.

Metering of power, water, other services.

Refrigeration machine indication and control.

Refrigeration machine indication and control Summer/winter switchover.

Remote temperature reset.

Indication of filter conditions, valve and damper positions, fuel reserves. High-low limit alarms.

#### GRAPHIC DIAGRAMS

Color coded representation of system and equipment on panels or screen-projected slides.

#### FIRE AND RAID ALARMS

Fire detection system with central alarm and location indication.

Conelrad air raid warning tied into central alarm and communication systems.

#### CLOCK SYSTEMS

Centralized programming of master and individual clocks and time signals.

#### SECURITY SURVEILLANCE

Closed circuit TV from remote areas. Audible alarms; sound detection.

#### LIGHTING SYSTEMS

Manual or automatic programming. Light level controls.

#### COMMUNICATIONS

Master intercom and music systems.

Paging center.

Closed circuit TV and radio intercom for remote supervision of repairs and installations.

#### MISCELLANEOUS SYSTEMS

Snow melting, lawn and sprinkler systems, control.

Time recording systems, machine operations. Indication of gas, radiation, or other hazardous conditions.

Transformer indication and control.

Indication and control of boiler and turbine

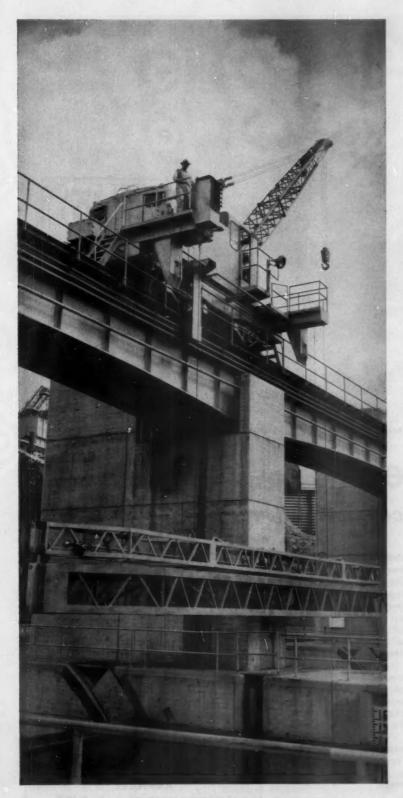
Feed water conductivity, analysis, and flow.

Domestic hot water control.

JOHNSON CONTROL

DESIGN . MANUFACTURE . INSTALLATION . SINCE 1885

For details about Johnson Control Centers, write for Bulletin 1040. Johnson Service Company, Milwaukee 1, Wisconsin.



## This special locomotive crane, designed to U. S. Army Corps of Engineers specifications, handles clean-up and maintenance duties at the New St. Anthony Falls dom in Minneapolis. The machine is electrically powered, travels on rails spaced 8 feet apart, and has special side-extensions for handling bulkheads as shown above.

## specialties are our business

Need a special crane for a special lifting job? Come to us. Not only do we offer you the world's widest range of standard crane types, but our 80 years' experience in customengineered lifting equipment is matched by no one.

Will your next project require mobile crane equipment? AMERICAN HOIST builds all basic types...rubber-tired, crawler, and locomotive.

Will your future plans call for gantry cranes, bulk unloaders, revolvers, derricks, or hoists? AMERICAN is the world's leading supplier of all these special machines.

Custom-designed lifting or materialshandling equipment? Of course!

We're ready, anytime, to work with you. Call us. EP-1003





The Oklahoma Test Road north of Oklahoma City will eventually be part of Interstate route 35

## **CONCrete** wins on Oklahoma Test Road with maintenance cost 65% lower than asphalt!

5-year traffic test, ordered by the Oklahoma legislature, confirms again the findings of state highway departments and other official tests. Connecting two-mile sections of concrete and of asphalt, both the best of their type, were built in 1955 on Oklahoma's US 77. For five years beginning Jan. 1, 1956, exact records were kept of all pavement maintenance costs. Total for concrete: \$557.82. For asphalt: \$1,591.87. And not only did the asphalt cost nearly 3 times as much to maintain during the five years—it is already getting its first resurfacing at an additional cost of \$43,753.

Substantial maintenance economy is one reason why concrete is the choice of so many states today. Engineers are designing concrete pavements to last 50 years and more. It's the one pavement that can be designed *mathematically* to meet specific wheel load requirements. It's the only pavement with beam strength and stability.

The Oklahoma Test Road proves again the long-term value of concrete pavements. The first cost isn't just a down payment. Concrete provides true economy for Interstate highways as well as for other heavy-duty roads.

#### PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

#### Complete resurfacing after only five years adds another \$43,753 to asphalt's upkeep!

Despite continued surface maintenance for five years, the asphalt pavement on the Oklahoma Test Road has deteriorated to the point where complete resurfacing is required. The asphalt sections are being overlaid with 1½ inches of surfacing to seal out moisture and provide a new wearing course. When comparison is made, as shown here, on the basis of total upkeep cost, concrete's advantage is dramatic.

#### CONCRETE

| 5-year surface maintenance | \$557.82 |
|----------------------------|----------|
| total surface upkeep       | \$557.82 |

#### ASPHALT

| 5-year surface maintenance | \$1,591.87  |
|----------------------------|-------------|
| complete resurfacing       | \$43,753.00 |
| total surface upkeep       | \$45,344.87 |



A RESOLUTION by the Mechanical Engineers' Association, adopting "General Rules for Air Conditioning Controls," was rewritten following a panel discussion at a recent MEA meeting in Los Angeles. The original resolution (page 141, Con-SULTING ENGINEER, September 1961) was an attempt to distinguish between the roles of the electrical and the mechanical consultants in air conditioning control design. The MEA panel which provided the revised form of the resolution was made up of representatives of the Consulting Electrical Engineers Association; the Mechanical Engineers' Association; the National Electrical Contractors Association: the Mechanical Contractors Association of America, Inc; and Barber Coleman, Johnson Service, and Minneapolis-Honeywell.

#### The New Resolution

The revised resolution, as accepted by MEA, includes most of the major items, in shortened form, that appeared in the earlier resolution: The air conditioning control system should be shown on the drawings schematically. Control instrument locations and the location and nature of the available power supply should also be drawn.'

"The system should be drawn on a joint mechanical-electrical (M-E) sheet, showing intertie between electrical, pneumatic, hydraulic, and thermostatic components. The M-E drawing should be included in both mechanical and electrical sets of plans. The M-E sheet may be omitted where the size of the job does not warrant its use."

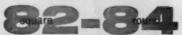
The mechanical section of the specifications should have a separate electrical work paragraph defining work to be done by the various trades. A similar and properly coordinated paragraph should appear in the electrical section of the specifications.

The installation and coordination of all air conditioning controls should be the responsibility of the mechanical contractor. The actual installation should be made by the controls contractor, and a letter shall be furnished by the manufacturer of the controls equipment that the system has been installed according to the manufacturer's recommendations.

"Time limit for submission and approval of requests for substitutions should be short enough to permit acceptance or rejection without jeopardizing construction schedules of all trades.'



weather-proof everlasting protected

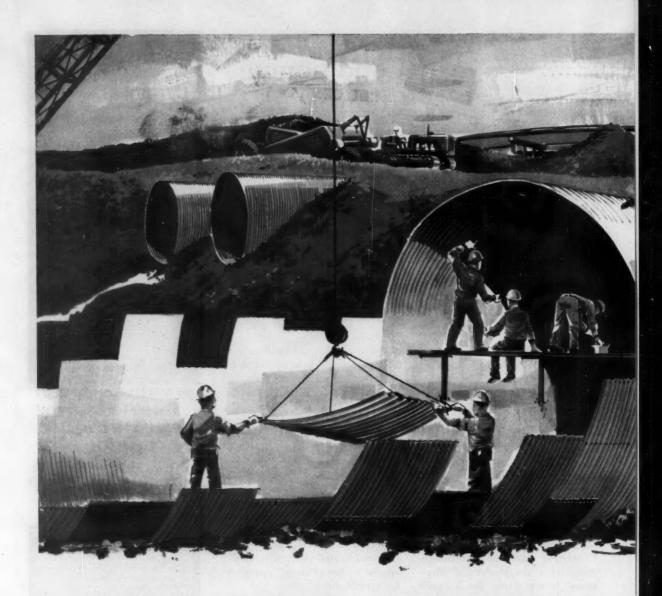


## by mc Philben

extenor and intenor ceiting surface applications under CANOPIES, MAR QUES, in SHOWER ROOMS, CORRI DORS, VESTIBULES, ALL PURPOSE ROOMS, LOBBIES, SHOPPING CENTERS. Absolute security application in PSYCHIATRIC HOSPITALS, PRISON CELLS, CHILDREN SHELTERS.

- 82 and 84 lines feature:
   ALL CAST ALUMINUM, sturdy, piece construction in both quarde and non guayeded units with integral cast hinge. Extra heavy .156 inch wa
- erformance. mcPhilben's EVERLASTING AND

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| ARMCO DRAINA<br>4951 Curtis Stre | GE & METAL PRODUCTS, INC.,<br>eet, Middletown, Ohio | a va | luable desi | ting Compression form<br>gn tool that is making | big news in |
| Send my free co                  | ppy of "The Corrugated Metal Conduit as a Compres-  | the  | engineerin  | g-construction                                  |             |

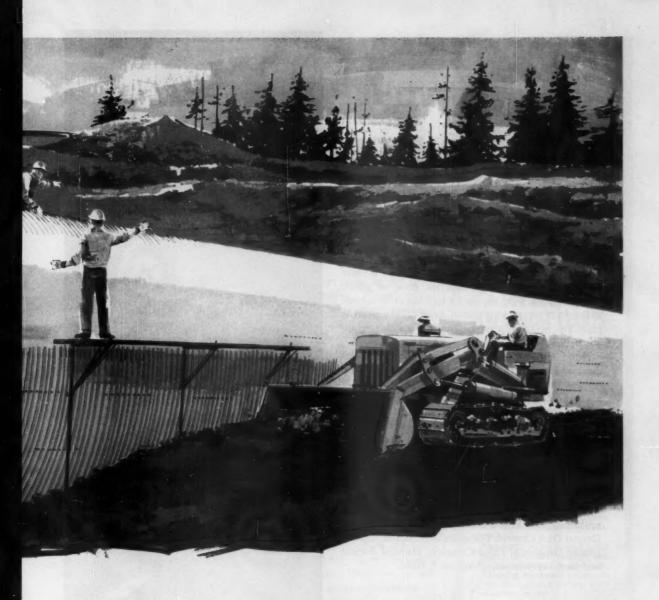
world.

FIRM

Arrange for Armco Sales Engineer in my area to discuss Ring Compression method in detail.

This new design concept for installing Armco Corrugated

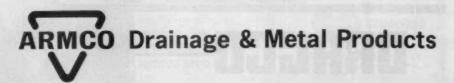
Metal Structures provides great economies by reducing metal thicknesses formerly specified for given loading conditions. In addition, it permits use of larger sizes for vehicular grade separation



## uses soil structure to cut costs

structures or drainage conduits.

A comprehensive discussion of this new method has been published and is now available in booklet form. It is complimentary, of course. Use the handy coupon to get your copy. Armco Drainage & Metal Products, Inc., 4951 Curtis St., Middletown, Ohio.



## is your client's progre showing?

Not too many years ago, smoke clouds over a plant meant prosperity. Today, with the flood of public opinion against dirty air, such a sign has other connotations: (1) the plant is out-of-date; (2) the plant is probably inefficient and wasteful; (3) the owners are postponing their civic duties.

Nowadays, clean stacks are a sign of good management and an up-to-date plant. Many companies are keeping stacks clean by collecting dust and fume with a Dracco Dust Control system. Dracco installations use cloth filter bags—made from fiber glass, natural or synthetic fabrics—to provide high-efficiency collection of all visible particles. Each system is customengineered to a particular plant layout, and to the characteristics of the dust or fume to be collected. Nuisance dusts can be controlled and discarded . . . valuable dusts can be returned to process.

If any of your clients are faced with air pollution problems, give them a boost by getting the facts on Dracco Dust Control. For more information, contact Dracco Division of Fuller Company, Harvard Avenue and East 116th Street, Cleveland 5, Ohio.

The use of glass cloth extends the application of Dracco bag-type filters to temperatures as high as 600°F., and sonic cleaning reduces maintenance costs. Higher temperatures are possible with auxiliary cooling. Dracco cloth filtration provides highest efficiency collection of dust particles even in the submicron range.



## Corporate Practice...

#### A Voice from Switzerland

HANS F. BUCHI

As a regular reader of your exceedingly well edited magazine for consulting engineers, I am interested in all discussions on matters related to the exercise of the profession. Among those published recently my attention has been especially attracted by Dr. Nord's opinions on corporate practice. This interest is explained by the fact that I am the owner, i.e., the sole shareholder, of a corporation (Hydraulic Ltd., Zurich, Switzerland) performing exclusively engineering services as consulting engineers.

Dr. Nord's statements and conclusions left me somewhat confused. I have experienced similar feelings on occasions when I discussed engineering contracts with my legal advisor: the resulting texts, based on the advisor's recommendations, were perhaps perfect from a legal point of view and would have protected me in every conceivable way. They had only one small flaw: they were not realistic and my clients would never have accepted them!

Cannot the performance of consulting engineering services by a corporation be considered and decided on the following three accounts:

¶ The first point is the form of business organization. The client, be he private or a public institution, is not overly concerned about the manner in which his consultant sees fit to organize his office and his business. A corporation may perhaps have more overhead than a partnership or a single engineer and therefore charge higher fees, other things being equal. But it offers also certain advantages, one of them being continuity. I have been approached more than once by clients - and been able to satisfy them - who made inquiries about drawings, computations, and contracts, for old structures, the respective documents having disappeared from their own files or having been misplaced during reorganizations. My firm keeps essential documents for 30 or 40 years, whereas an individual consultant or his heirs would probably have destroyed them long ago. Moreover, a corporation has generally more assets of which a client may try to get hold in case of damages; a single engineer who has committed a serious mistake and caused a heavy loss may quietly slip away to South America if the amount involved would break him (I am using vivid colors to stress the point!).

In reality, a client does not treat a corporation as a group of more or less anonymous persons, but he mostly insists, and rightly so, on talking always to the same man, if possible the president.

¶A delicate point is that of bias. Of course, the larger the corpora-



OVERSIZED ROLLER BEARINGS, in cartridges for easy removal HELICAL ALLOY STEEL TIMING GEARS, piloted to shaft and bolted to timing hub

CLOSE-GRAIN CAST IRON IM-PELLERS, precision bored to receive shaft

MACHINED SUB-BASES as standard equipment

LUBRICATION by force-feed pressure system

Write for detailed specifications on the versatile Sutorbilt Blowers. Dept. B.

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Lehigh Industrial I.E. Fans... featuring heavy duty, unique channel construction, all-welded mild steel wheels of the long shaving design . . . solve difficult exhaust problems because of their non-clogging characteristics. They incorporate a universal housing, which permits rotation and discharge to be modified to facilitate variable field conditions.

A complete range of sizes is available in both 70° to 250°F and 251° to 600°F construction. All standard drive arrangements are available and will be furnished according to your specifications.

Rugged, air-tight construction: the fan housing is welded on the inside with a continuous fillet weld. This provides gas-and air-tight housing with joints of maximum strength.

Standard, self-aligning ball-bearing pillow blocks . . . grease lubricated . . . are featured on all Lehigh Industrial I.E. Fans.

Optional accessories include an inspection door, inlet and outlet flange, heavy duty housing construction, and drain plug.

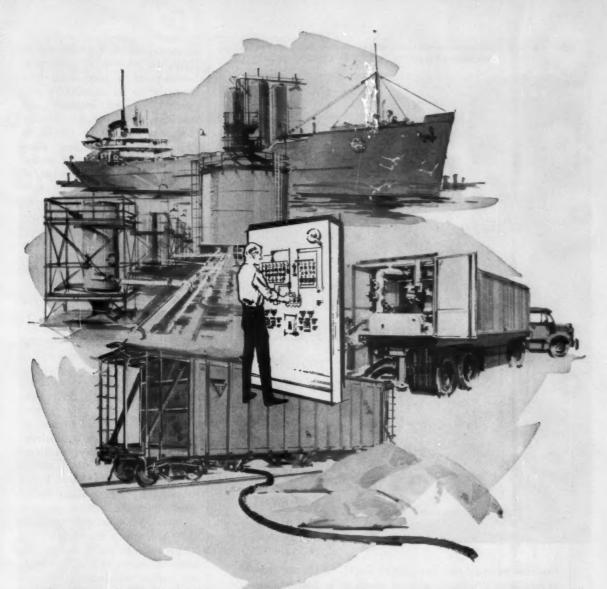


Get detailed information on how Lehigh I.E. Industrial Fans can solve your industrial exhaust problems with dependable nonclogging performance. Your Lehigh Representative will be happy to supply you with full details. Or, if you choose, write directly to us for Bulletin L-5:

LEHIGH FAN & BLOWER DIVISION FULLER COMPANY, CATASAUQUA 4, PA.

Subsidiary of General American Transportation Corporation
"See Chemical Engineering Catalog for details and specifications."

tion, the greater is the probability of its getting engaged in manufacturing of products, licensing of processes, etc. Clients generally know these cross-connections and take them into account; corporations acting as consultants ought to be obliged to disclose their financial engagements and ties fully and accurately. Besides, where does impartiality end and bias begin? If a close friend of mine is an officer or a director of a large manufacturing concern, I may get detailed information on the products of his firm which, together with my personal sympathy, will unconsciously incline the balance of my favor somewhat in that direction. Unfortunately also, there have been cases where independent engineers have accepted gifts and percentage payments from contractors or manufacturers for specifying certain products or making recommendations to the client. I cannot see why engineering practiced by a responsible corporation, providing the above mentioned condition of publicizing their ties is observed, represents for a client a risk of being tricked or mislead, substantially different from the situation in which services are performed by a single engineer or a partnership. The main point which concerns the public at large is safety of structures. In those countries and instances where designs, drawings, and calculations must bear the signature or seal of a licensed engineer (in Switzerland no such requirement exists), I think it should be a relatively simple thing to extend that obligation to corporations that issue such documents. Dr. Nord uses strong words to deny the effectiveness of such a measure and seems to think that a registered engineer employed by a corporation may in many cases become a mere puppet. According to my experience this is seldom, if ever, the case. On the other hand, I have had the opportunity of witnessing, in



## Fuller makes things move in the process industries

materials fast. They have a minimum of

moving parts. They're closed-in to keep

both plant and product cleaner. They

lend themselves readily to remote and

push-button control. Through its inte-

gration of facilities, Fuller engineers, de-

signs, produces and erects pneumatic

conveyor systems to handle dry pulver-

ized or granular materials from alum to

zinc oxide, fly ash to green coffee beans.

The flow of profits in the process industries depends increasingly upon the physical flow of dry bulk materials from place to place: from cars, trucks, ships and barges, into storage and out, through a complexity of in-plant operations.

This movement, of itself, adds nothing to product value-yet can cost as much as the materials themselves. Cutting these handling costs—through the application of air-is a major Fuller function. Pneumatic conveyors move

But basically, what Fuller moves is costs... in the down direction. Fuller

is qualified by long experience in the conveying of dry pulverized or granular materials to serve every segment of the process industries, from initial planning of systems to installation. In addition to four basic types of pneumatic conveying systems, Fuller also produces heavy process equipment like rotary kilns, mills, crushers as well as fans, blowers, compressors and dust collection equipment. Write today for more details about Fuller services.

Visit Booth 446 at Chemical Inde

See Chemical Engineering Catalog for details and specifications.

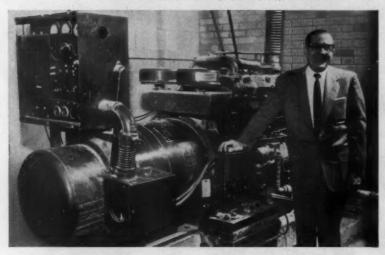


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Business as usual can continue in the H. C. Prange store at Appleton, Wisconsin, when a storm or accident causes a power blackout. A 75 KW Kohler electric plant will provide immediate emergency power for lighting, automatic heat—forestalling risk of loss, panic or distress.

Today's increasing dependence on electrical facilities makes stand-by power a vital necessity in stores, hospitals, schools, theatres—public buildings of all kinds, as well as homes. Kohler plants are economical to operate, easy to maintain, known everywhere for reliability.

To help you write specifications, a complete manual will be sent on request with data on sizes from 1000 watts to 115 KW, gasoline and Diesel.

Write Dept. K-30. See us in Sweet's Catalog.

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ENAMELED IRON AND VITREOUS CHINA PLUMBING FIXTURES • ALL-BRASS FITTINGS
ELECTRIC PLANTS • AIR-COOLED ENGINES • PRECISION CONTROLS

a country which I prefer not to name, the behavior, or rather misbehavior, of a poor devil who happened to be an officially recognized licensed engineer and sold his seal and signature to other engineers lacking the official license, thereby legalizing plans which he often could not understand, let alone be capable of producing himself. Among registered engineers or individual consulting engineers there may always appear some black sheep who assume tasks for which they are not sufficiently well prepared and who are lax in checking the work of their employees. The fact of being registered or licensed does not guarantee a 100 percent perfect engineer; I apologize for mentioning this obvious truth.

Finally, I am convinced that a registered engineer of a corporation, whose services and signature are required by law or statute, will automatically gain stature and be able to assert himself, if need be, in the face of inadmissible demands by officers or directors of the corporation, the more so as a registered engineer ought in any case to possess, among other things, the personal qualities of courage and independence.

By the way, a corporation that means to make profits and stay in business cannot skimp in providing designs and products of high quality, which includes safety.

The reasons advanced from the foregoing three points of view against corporate practice in engineering do not seem to me to be valid, provided corporations are subjected to certain special provisions. As for the fact that often successful corporations are able to handle projects which are simply too big or too involved for a small organization or an individual engineer, it belongs to another set of problems, no doubt of prime importance to the individual and especially the young consultant, but in my opinion not capable of solution by legal action.



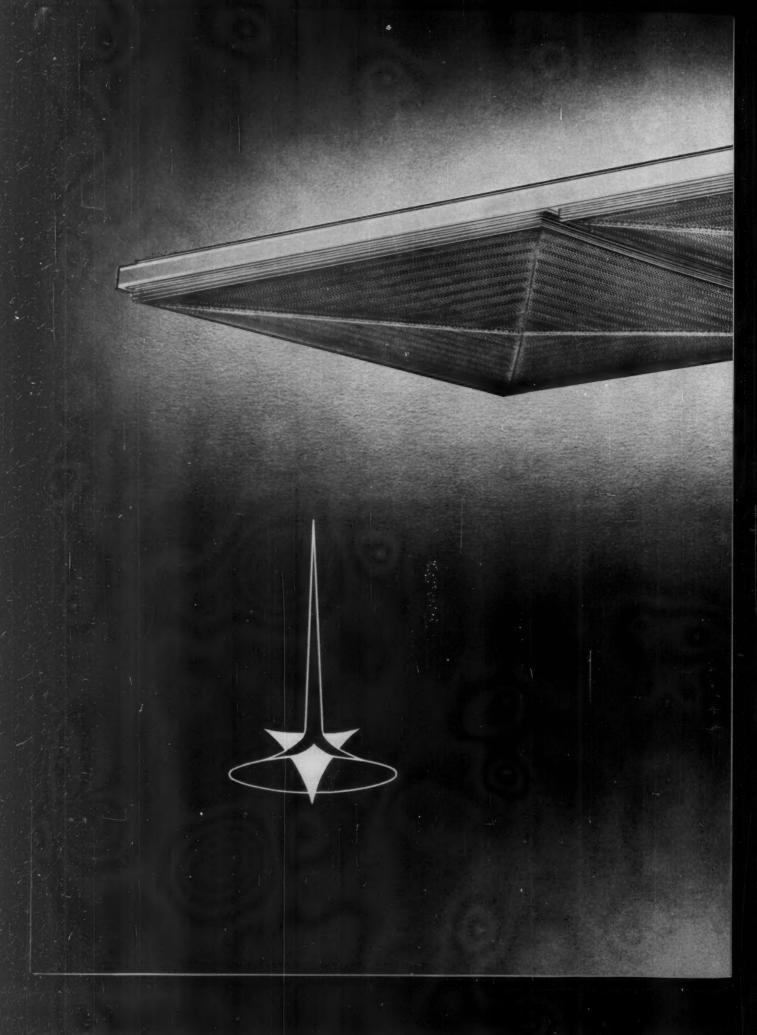
### FRAMING COSTS CUT 204/SQ. FT. WITH COMPOSITE STEEL DESIGN

Engineers on this project specified the Nelson Composite Beam and picked up a substantial 20¢-per-square-foot saving over the more conventional construction techniques (beam and slab, steel frame and fireproofed bar joist or steel frame and block). The reduction of the girders to 12 WF provided a saving in construction height which, in turn, gave the engineers opportunity to reduce story height. The Nelson Composite Beam offers engineers a choice of meeting equal load requirements with as much

as a 30% reduction in structural steel weight—or an increase in strength with the same size beams. It provides longer spans with greater load-carrying capacity per pound of steel; more unobstructed floor space, through wider

spacing of columns. For more information about composite-designed buildings and the Nelson Composite Beam, write to NELSON STUD WELDING, Div. of Gregory Industries, Inc., Dept. 14, Lorain, Ohio.







# Introducing TIARA

for offices, stores and schools

Just 3 1/6" slim! New Day-Brite TIARA provides a clean, modern look never before possible with a surface-mounted unit.

A distinctive glow around its waferthin frame softens brightness for high visual comfort, and gives the fixture a luminous floating appearance. Pure enchantment for any interior!

Precision Pyramid lenses create additional ceiling interest. There is no noticeable variation in sur-

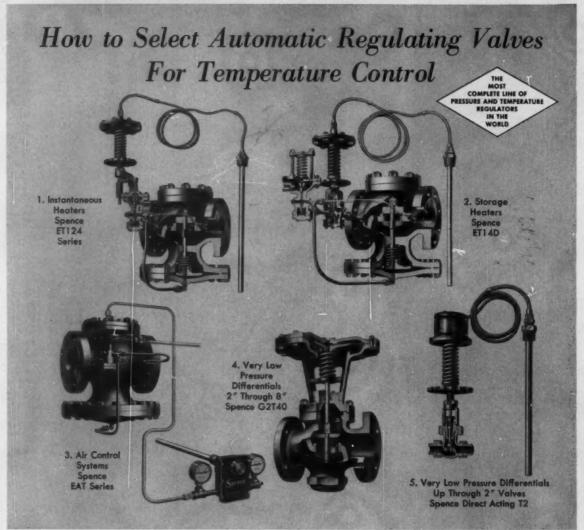
face brightness ... no hot spots. Lighting quality is definitely Day-Brite.

For those who want the very finest, it's new Day-Brite TIARA . . . the crowning achievement in lighting fixture design. For complete information, contact your Day-Brite representative or write for free 8-page TIARA booklet. Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.

DAY-BRITE

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

Lens by Holophane Co., Inc.



During the past year, our field representatives have reported many cases of improperly, and uneconomically, applied temperature regulators. To help you avoid some of these costly mistakes, here are a few tips on selecting the most effective and economical temperature regulating valves for your applications.

- Instantaneous heaters require a special action for close temperature control and freedom from hunting. In the Spence ET124 series, steam pressure is modulated according to temperature (demand) and is automatically regulated at any pressure established by the demand.
- 2. Storage heaters, on the other hand, are more economically controlled by the Spence ET14D, which in-

cludes a simple temperature-actuated pilot that opens and closes the main valve to maintain a constant temperature.

- 3. Air control systems can now have a ±5°F control accuracy under wide and instantaneous load swings with the Spence EAT regulator. Engineers report savings of up to 50% in installed costs with this recently developed Spence cascade system when it has been used in place of conventional instrumentation.
- 4. For the combination of very low pressure differentials and air or water control, Spence recommends Type G2T40. This single seated pilot operated valve provides fast, positive response in 2" through 8" valves. Double seat Type G22 is also available in 10" through 12".
- 5. When very low pressure differential is encountered with valves of 2" or less, the Spence direct operated T2 is recommended. The sensitive vapor tension thermostat responds quickly to small changes in bulb temperature for continuous, accurate control.

In this brief description of industrial process and heating temperature control, we have given a few important tips in proper regulator selection. If you would like more detailed information on these control applications, write for the new Spence Temperature Control Bulletin IV 1014.

SPENCE ENGINEERING COMPANY, INC.

Walden 1, N. Y.

Paulsen Spence, P. E., President

## Our Authors . . .



Mrs. Gloria Evans, the first woman author to grace the pages of Consulting Engineer, is a graduate of Assumption College, in Windsor, Ontario, Canada. After several years work in the public library field, she went to Parke, Davis & Company, where she organized the firm's engineering library at the home office in Detroit. Mrs. Evans has written several articles on information retrieval systems and on the organization of engineering libraries, and is chairman of the Publicity Committee of the Engineering Section of the Special Libraries Association. Her article on the organization of a consulting engineer's library is on page 114.

Edmund B. Besselievre has worked as a consultant in sanitary engineering throughout the United States and in several foreign countries. He designed the complete sewage treatment and water works for Buenos Aires, and has been called in for special projects consultation by the U. S. War Department, and federal and local government agencies in Africa, South America, Asia, and Europe. Besselievre has written a book on foreign enterprise, and articles for several technical journals, as well as editing various technical manuals. He is a Fellow and Life Member of ASCE. His article on underground sewage treatment plants is on page 130.

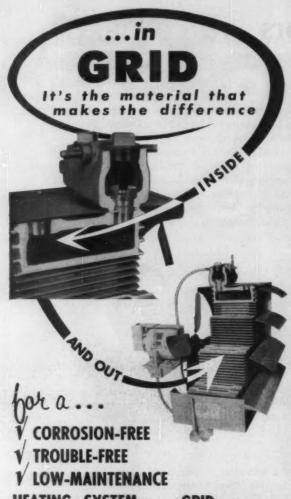




E. H. Thalmann received a bachelors degree in electrical engineering from Cooper Union. He joined Ebasco Services, Inc., in 1941, and is now Principal Electrical Engineer, in charge of corrosion control projects, electric power plants, underground cable systems, underground structures at industrial plants, transmission and distribution piping systems, and general corrosion studies and grounding investigations. He is currently chairman of a National Association of Corrosion Engineers committee investigating the use of instruments for measuring corrosion. His article on the importance of cathodic protection is on page 122.

John R. Snell received his BS and MS in civil engineering from Vanderbilt and the University of Illinois, and a Ph.D. in sanitary engineering from Harvard. He opened his own practice in Boston in 1947, left it in 1952 to head the Department of Civil and Sanitary Engineering at Michigan State University, then returned to private practice in 1956, in Lansing, Michigan. Snell has served as consultant to several foreign governments, the World Health Organization, and the International Cooperation Administration. His article, on page 106, tells what is wrong with our fallout shelter program, and how it can be remedied.





HEATING SYSTEM . . . GRID Cast Iron Construction resists carrosion externally from acid fumes and internally from electrolysis. No leaking from rotted cores.

GRID one-piece cast iron heating sections and headers are leak-proof on steam pressures up to 250 p.s.i. 450° temperature. Smaller steam lines cost less.

GRID heating sections with widely spaced fins cast integral with steam chambers are easy to clean — Will not "mat" on air intake side.

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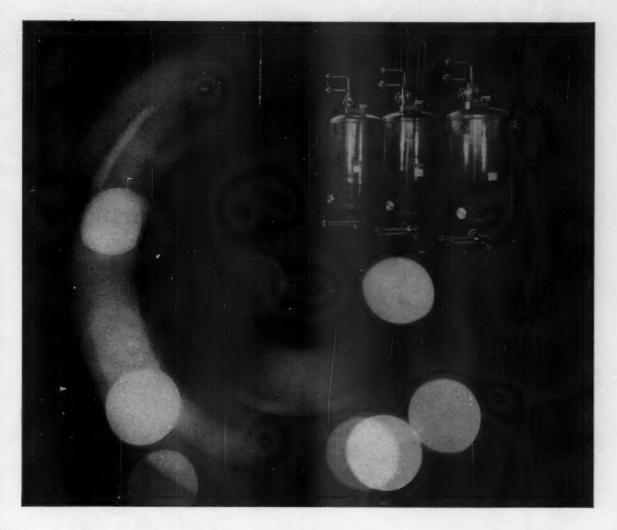
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John Faas and Walter Hough, of Walter Kidde Constructors, Incorporated, have relied upon topographical models for several years, to show inexperienced clients how the finished project will look. Faas, who has been with Kidde for 8 years, is chief engineer and is in charge of a department of over 100 engineers and draftsmen. He is a 1940 graduate of Purdue, with a BS in mechanical engineering. Hough, who has been with Kidde for 16 years, is chief architect and is in charge of 12 architects and draftsmen. Before coming to his present job, he was a Lieutenant in the U. S. Navy. Their joint article on the value and application of topographical models is on page 127.



Philip Green and Joseph Robbins, of Pope and Evans, both have extensive experience in the field of computer installation. Green, who received a BS in mechanical engineering and an MS in chemical engineering from Brooklyn Polytechnic Institute, is supervising mechanical engineer for P & E. He is a member of ASHRAE, and is registered in New York and Pennsylvania. Robbins, who received a BS in mechanical engineering from CCNY, is a project manager, as well as a partner in P & E. He is registered in New York and Connecticut. Their joint article, dealing with the problems encountered in environment control for computers, is on page 110.



Atoms and lons... An essential in nuclear energy conversion to electric power is ultra-pure water. In the primary loop of the reactor, the water could gradually accumulate radioactive particles if not treated. The secondary loop, as in conventional boilers, requires removal of silica from the makeup water to safeguard the turbines. Silica forms a glassy deposit on turbine blades that can impair generating efficiency, causing ultimate shutdown for removal with attendant costs. To insure against such an eventuality, thousands of minute ion-exchange beads in Cochrane demineralizers remove these contaminants effectively. Cochrane scavenger precoat filters and demineralizers are also highly efficient in removing traces of iron, copper and other solids from condensate in conventional and once-through boilers. Safeguard your equipment with a call to Cochrane. In water conditioning... the name is Cochrane. For a copy of our handbook on demineralization, write on your company letterhead to Cochrane Division, Crane Co. 3112 N. 17th Street, Philadelphia 32, Penna.

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|--------------|--------------------|--|--------------|--------------------|--|
| Wt.<br>Loss* | Penetra-<br>tion** |  | Wt.<br>Loss* | Penetra-<br>tion** |  |
| 6.1          | 52                 |  | 4.8          | 48                 |  |
| 11.1         | 81                 |  | 8.8          | 75                 |  |
| 12.1         | 89                 |  | 10.9         | 89                 |  |
| 17.4         | 88                 |  | 12.2         | 97                 |  |
| 19.7         | 107                |  | 16.3         | 98                 |  |

\*Wt. Loss, oz/ft<sup>2</sup> \*\*Penetration—mils (Average Max.)

#### SEA WATER IMMERSION TEST

| Mild Steel                              | 2162 | 1439 | 36 | .007 | Perf. | 128 |
|---|------|------|----|------|-------|-----|
| Hand Puddled<br>Wrought Iron            | 2384 | 1401 | 32 | .006 | Perf. | 115 |
| Mechanically<br>Puddled<br>Wrought Iron | 2384 | 1247 | 28 | .006 | 139   | 80  |

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## The Readers' Guide

Influencing Specifications page 98

"The industrial client seems to swing a bigger stick than the commercial or government client . . . [but] no client throws his weight around to any great degree." A report from the Committee of One-Hundred analyzes the problem of who specifies what.

Engineering Libraries page 114

"Finding even one vital statistic for the right person at the right time may be all that is needed to solve an important problem." Mrs. Gloria Evans points out the advantages a firm can gain from its own engineering library, and how easily a library may be set up.

Fallout Shelters
page 106

"If Russia or Communist China should decide that they are better prepared to survive an attack than we, they may chance a war." John Snell questions the engineering and economic feasibility of most of the fallout shelters designed by government agencies.

Computer Environment page 110

"One requirement remains common to all [computer] installations . . . a predetermined and controlled environment must be provided." Joseph Robbins and Philip Green explain the importance of air conditioning the computer installation, and how to do it.

Sewage Treatment page 130

"It is difficult to understand why more attention has not been given to the construction of . . . underground sewage treatment plants." Edmund Besselievre charges that engineers, and the public, are foolish for insisting on above-ground sewage treatment plants.

Cathodic Protection page 122

"The station grounding grid . . . of interconnected buried metals constitutes a large galvanic cell which aggravates corrosion of the underground structures." E. H. Thalmann points out the importance of cathodic protection for the grid systems of large power plants.

Topographical Models
page 127

"One topographical model is worth a dozen sketches and several thousand words of explanation." Walter Hough and John Fass show the value of scale models in preliminary design work.

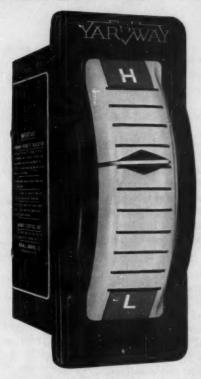
Mathematical Instruments page 102

"Bion's book . . . met the need for such a work in a period when instruments were becoming of increasing importance in the work of the engineer." James Kip Finch continues his series on the great books of engineering, describing the first book on instruments.



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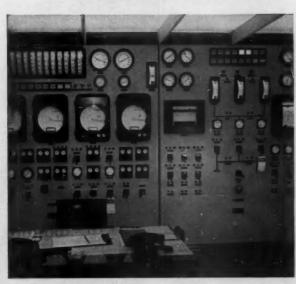
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## Specifications ... Who

A REPORT FROM THE COMMITTEE OF ONE-HUNDRED. On designs for such projects as sewage treatment plants, bridges, dams, and highways, the engineer is king. But the design of buildings, whether industrial or nonindustrial, often involves a complex relationship between the engineer and the architect, the owner, and the contractor. It is not so much a matter of who does the design and who writes the specifications, for, in the actual performance of these tasks, the architect and the engineer are wise enough to tend to their own knitting. Rather, it is a matter of who influences whom, before the final design concept is crystalized and the actual specifications are written.

By probing the Committee of One-Hundred in this sensitive area, Consulting Engineer expected to get — and got — some rather strong reactions. The following report, based on these reactions, is worthless so far as any specific project is concerned. It does, however, give a good general picture of the relationship between the engineer and the architect, the contractor, and the owner, in the field of building design and construction. Though individual members of the Committee of One-Hundred may disagree on details, there is good evidence to indicate that the engineer is emerging as the strong man who controls building design and construction.

IT WOULD BE ridiculous to assume that consulting

engineers and architects are completely happy with each other. As one consultant puts it, "The typical architect

will cheerfully specify a septic tank in downtown Manhattan if the owner mentions it." However, the general attitude on this subject seems to be summed up best by the engineer who said, "I would much prefer to have mutual cooperation between the engineer and the architect, rather than dictation by either one. We find that we have less and less difference of opinion with a given architectural firm on each succeeding project. No doubt, this is due to our having become familiar with each other and the way we each work. It is also a matter of establishing mutual

confidence in each other's work." Thus, the outstanding consulting engineering and architectural firms stand side by side in resisting the uninformed suggestions of the owner and the cost-cutting pressure of the contractor. There is a mutual concern for the ultimate quality of the completed project.

#### The Contractor's Influence

It has often been assumed that the contractor has great influence over specifications. Actually, this is not true, and reputable contractors are the most ardent supporters of tight specifications. Only when the contractor is bidding against tight specifications can he be sure that he is on an equal footing with his competitors. Thus, though some consulting engineers in-

## Makes The Decisions

dicated that the contractor might have a relatively free choice in purchasing up to 10 percent of the equipment covered by the specifications, the average of the group opinions seems to indicate that this is true for less than 5 percent.

Relatively open specifications are required on most government-sponsored projects. However, even here the designer can write tight performance specifications which effectively determine the quality level that the job requires and limit the number of manufacturers whose products can be used. It is probably a fact that leose specifications prepared by state highway departments (because of legal requirements) are at the root of a great many of our current highway scandals. Where specifications are loose, there is always the temptation for someone to try to chisel.

#### The Owner's Influence

Just how influential is the owner in determining the ultimate specifications for his building? The industrial client seems to swing a bigger stick than the commercial or government client. However, no client actually throws his weight around to any great degree; consulting engineers estimate that clients make specific requests on less than half of all projects, and these requests seem to involve no more than 10 percent of the total value of construction. Obviously, a manufacturer of air conditioning equipment is not going to allow his new office building to be equipped by a competitor, nor is the manager of a large shopping center going to allow an addition to be erected with a heating and ventilating system totally independent of and different from the original. But, even in the matter of standardization for maintenance and inventory cost reduction, the consulting engineer often is forced to lead the client. Consulting engineers are quick to point out that it is the owner's privilege to ask for specific equipment, but it is up to the engineer to evaluate the request and grant it only when it meets the client's desired level of quality.

Generally speaking, consulting engineers consider themselves specialists who are retained to advise the client. They are unhappy when the role is reversed. For example, one engineer states, "Any time one of my clients would dictate to me as to the equipment or materials I am expected to use in my highly specialized work, I would leave the job. I have never been dictated to, because, whenever I suspect such an influence is developing, I work to offset it immediately."

#### **Architect or Engineer**

In spite of their inability to arrive at a mutually satisfactory distribution of fees, consulting engineers and architects seem to have a genuine respect for each other's ability. Thus, regardless of which happens to be the prime designer, the professional design talent that is retained for specific phases of a project seems to be allowed a free rein in writing the specifications. When engineers or architects are retained either intra- or interprofessionally, they assume that they will be granted the right to control the specifications for their part of the project. Naturally, the prime designer on a project will have to coordinate the specifications. However, this is not done by arbitrary decision after the specifications are written, but, rather, by coordinating conferences while the design work is in progress.

#### **Construction Supervision**

Once the specifications have been written, construction supervision is the key to their control. Of course, the consulting engineer expects to check shop drawings and to have some control over bid submittals. But often this is not enough, and many consulting engineers make it a point to visit their projects during the construction period, even though they have received no compensation for this service. Often it is a matter of self-protection. For example, one engineer reports, "Our firm recently designed a bridge for the Federal government but did not have construction supervision as a part of our contract. Nevertheless, our engineers visited the site of the work, and they found that the reinforcing bars in the bridge deck slab had been improperly placed. Had they remained as they were when the concrete was poured, a defective slab would have resulted. This matter was called to the attention of the resident engineer and corrective measures were taken. It is extremely dangerous for any firm to undertake a project without having construction supervision. If it does, it must be prepared to take the consequences, or to establish some method of voluntary supervision to protect its own reputation."

Consulting engineers generally have strong feelings about construction supervision. In fact, some will not take on a project unless they receive an adequate fee to cover necessary supervision. The engineer can, of course, arrange to visit the project on an unofficial basis. But without the authority to supervise, he is in a difficult position if he does discover anything amiss on the project. If the engineer is to be responsible for his work, and the law says that he is, he must be sure

|   | PULLOWN OF               | 4 Z FIEWER | Since applications of the second seco |      |      | CONTROLL STATES |      |   |      |      |  |
|---|--------------------------|------------|--|------|------|-----------------|------|---|------|------|--|
| INDUST<br>BUILDI<br>(i.e. manufactu<br>chemical, and c  | NGS<br>ring, power,      | 52.3       | 32.2   | 20.1 | 23.9 | 14.5            |      | On the basis of the break-<br>downs above can you estimate<br>what percentage of total can- |      |      |  |
| NONINDU<br>BUILDII<br>(i.e. churches, so<br>institutions, and of  | NGS<br>hools, offices,   | 57.0       | 28.0   | 29.0 | 25.9 | 16.1            | 9.8  | 1 <b>7.</b> 1   | 9.6  | 7.5  | what percentage of total con-<br>struction cost is specified for<br>each category for each type<br>of building?  |
|   | Engineer                 |            | 68.0   | 29.5 |      | 71.5            | 71.0 |   | 74.0 | 74.5 |  |
| INDUSTRIAL  | Architect                |            | 18.5   | 54.5 |      | 7.5             | 7.5  |   | 4.0  | 4.5  |  |
| BUILDINGS   | Contractor               |            | 3.0  | 3.0  |      | 3.0             | 3.0  |   | 4.5  | 4.5  |  |
| and the same of the same  | Owner                    |            | 10.5   | 13.0 |      | 18.0            | 18.5 |   | 17.5 | 16.5 | 2. When the engineer is the prime designer, can you esti-  |
|   | Engineer                 |            | 61.0   | 10.5 |      | 73.5            | 70.5 |   | 75.5 | 79.0 | mate by percent of total con-<br>struction cost of each cate-<br>gory, what influence each<br>party has on specifications?   |
| NON-  | Architect                |            | 30.0   | 73.0 |      | 14.0            | 18.0 |   | 11.5 | 8.0  |  |
| BUILDINGS   | Centractor               |            | 3.0  | 5.0  |      | 3.0             | 2.0  |   | 2.0  | 2.5  |  |
|   | Owner                    |            | 6.0  | 11.5 |      | 9.5             | 9.5  |   | 11.0 | 10.5 |  |
|   | Engineer                 |            | 43.0   | 8.5  |      | 57.0            | 64.0 |   | 62.0 | 69.0 |  |
| INDUSTRIAL  | Architect                |            | 43.0   | 71.5 |      | 24.5            | 20.5 |   | 20.0 | 15.0 |  |
| BUILDINGS   | Contractor               |            | 4.5  | 4.0  |      | 3.0             | 2.5  |   | 2.0  | 2.0  |  |
| The second of the second of   | Owner                    |            | 9.5  | 16.0 |      | 15.5            | 13.0 |   | 16.0 | 14.0 | 3. When the architect is the<br>prime designer, can you esti-<br>mate by percent of total con-   |
| 1   | Engineer                 |            | 42.0   | 5.8  |      | 55.0            | 59.0 |   | 61.0 | 67.5 | struction cost of each cate-<br>gory what influence each<br>party has on specifications?   |
| NON-  | Architect                |            | 45.5   | 77.2 |      | 31.5            | 26.5 |   | 24.5 | 19.0 |  |
| BUILDINGS   | Contractor               |            | 2.5  | 3.0  |      | 3.0             | 2.5  |   | 2.0  | 2.0  |  |
| The said the said to the said | Owner<br>Taganga Sistana |            | 10.0   | 14.0 |      | 10.5            | 12.0 |   | 12.5 | 11.5 | والمتعارض والمتع |

This chart is not an indicator of who writes the specifications. Rather, it is an attempt to measure the relative influence of the consulting engineer, the architect, the owner, and the contractor in arriving at specification decisions. It is based on estimates from firms primarily engaged in engineering design for architects.

that a qualified and impartial construction supervisor is on the job — preferably himself.

#### **Purchase and Substitutions**

With the growing complexity of our modern buildings, many clients have turned to the consulting engineer for assistance in the purchase of materials and equipment. There are many variations on this theme, and in some instances they actually take away from the contractor his traditional privilege of making the purchase. This seems to be particularly true on industrial buildings and power plants. Regardless of how much assistance the client desires, the consulting engineer should have the opportunity to evaluate all bids.

To the uninitiated, the typical "or approved equal" clause in specifications seems to offer the contractor a wide open door for substitution. However, most consulting engineers require that requests for substitution be made in writing well before the contract award date. The substitution is then either accepted or rejected in writing, and the other bidders may or may not be notified. This latter point is rather fine in terms of ethics, since a contractor's request for a substitution often may reveal to his competitors some unique solution he has developed for a project.

Consulting engineers have developed many interesting systems for controlling the quality of the project. One Eastern firm writes performance specifications for mechanical and electrical equipment which limits the potential suppliers to two or three manufacturers. No "or equal" clause is included. However, accompanying the performance specification is a materials list that gives the names of all of the manufacturers of various types of equipment that are acceptable to the consultant. When the contractor prepares his bid, he circles the company name of the manufacturer whose equipment he intends to supply. He is allowed to circle only one name for each product. Thus, every contractor submits a base bid which meets the minimum standards of desired quality.

In addition to the materials list, this same consultant also supplies the contractor with a substitution sheet which allows him to propose the use of other manufacturer's equipment than that normally acceptable. However, all such substitutions are listed as additions or deductions from the base bid and do not have any effect on the low bidder, who is selected solely on the basis of the base bid in conformance with the specifications and materials list.

#### **Manufacturers' Competition**

Consulting engineers are deeply concerned with the problem of maintaining high design standards through proper control of the specifications. Thus, the trend is for tighter specifications and for the consulting engineer to retain greater control over them, regardless of whether he is the prime designer or not.

One facet of this problem is the tendency of manufacturers to engage in straight price competition. As one consultant puts it, "Manufacturers started some six or eight years ago to see who could make a given product to sell the cheapest. Many of the quality manufacturers of even 10 years ago are now, in my opinion, producing 'junk.' Most owners do not know the difference between quality and 'junk,' and are satisfied as long as the initial investment is low. The consulting engineer probably could do more than anyone else to improve the quality of materials and equipment."

Taking the opposite side of the coin, another consulting engineer argues that he must maintain greater control over the specifications because, "During recent years the first real breakthroughs occurred in materials, processes, and equipment, so that we can get materials better designed for a specific job than we could during the past 30 or 35 years. In the past we had to make do with conventional equipment, but now we must be on our toes to keep up with new de elopments. It is a fast changing world, and, though it may cost the consulting engineer to experiment, it is an obligation he cannot avoid."

#### Conclusions

There are many other reasons why consulting engineers must assume greater authority. Not the least of these is the matter of legal liability. There is also the matter of operation and maintenance of equipment and materials. The consulting engineer's clients are being educated to better air conditioning, lighting, and similar services. To be sure that these function properly, it is necessary for the consultant not only to design and specify the right kind of equipment, but also to educate the client in its use.

Perhaps the ultimate goal of the consulting engineer is to arrive at that point where the contractor will say to the client, in the blunt words of a veteran of many years in private practice, "That damned consulting engineer is a rough SOB, but he has given you a good set of drawings and specifications, and I know that he means for the job to be done in accordance with them." The contractor, after all, is the one who must live with the engineer's and architect's drawings and specifications. Though he may not be able to design a tall building himself, he is the first to know if the job has been well done. He likes the plans complete, the specifications tight.





## Mathematica

Nicolas Bion, author of the first book on mathematical instruments.

UNDER THE TITLE A Treatise on the Construction

CE exclusive and Principal Uses of Mathematical Instruments, Nicolas Bion published his major work in Paris in 1709. Bion

(1652-1733) was a French manufacturer of and dealer in terrestrial and stellar globes, and other "instruments de mathematique." His portrait bears a legend, stating that, "he shows us the land, sea, and sky; and, through his art, the stars are brought closer to our eyes." These accomplishments apparently pleased Louis XIV, who appointed Bion "Engineer to the King for Mathematical Instruments."

Bion's book, the first to deal solely with instruments, evidently met the need for such a work in a period when instruments were becoming of increasing importance both in the work of the engineer and in the further evolution of natural science. An amended and corrected edition appeared in 1723, and a third in 1758; an English translation by Edmund Stone in 1713 was followed by another in 1758. The book also was translated into German. The treatise thus remained a standard text through much of the 18th century, for, as Stone remarks, "In a Word, this Treatise here published is a sufficient Explanation of the main Body of all the Instruments of the most Value, and in the greatest Esteem, that are generally made and sold in the Shops of the Mathematical Instrument-Makers."

#### **Inclusions and Omissions**

Since it reflected current practice, Bion's book is of interest not only for the instruments it includes but also for several important developments which are not mentioned. Stone's translation is especially valuable, because he adds notes to each book, or chapter as we would now call them, on additional instruments used in England. He admits that, "The French Instruments, described by Bion, are, in the main, the same as those used among us," but insists, "I never did see one French Instrument so well framed and divided as some of ours have been...I, therefore, thought of adding some English Instruments to those of Bion."

Again, quoting Stone, "Mathematical Instruments are the means by which the Sciences are rendered useful in the affairs of Life... They connect, as it were, the Theory to the Practice, and turn what was bare Contemplation to most substantial Uses." Much of Bion's book is devoted to other fields than engineering—astronomical, navigational, and military instruments; sundials and clocks; and, in Book III, a diversified group of "curious" instruments, including loadstones (i.e. magnets) and the microscope. Books I, IV and V, however, describe drafting, angle reading, and leveling devices of special engineering interest.

#### **Basic Instruments**

Bion opens his work with "Definitions necessary for understanding this Treatise," covering points, lines, circles, and other items, especially those involved in the graphic solution of problems. His discussion of "the most simple and most ordinary instruments" which follows covers the usual tools of the draftsman: the compass, rulers, parallel rules, drawing pens, and pencils, many of which had been in use for centuries—and, it is also interesting to note, the pantograph. One is surprised, however, to find that an entire book (II) is devoted to proportional dividers—a device seldom

### nstruments

JAMES KIP FINCH

used today, but one of special importance in a period when graphical methods were the common and standard means for avoiding mathematical computation.

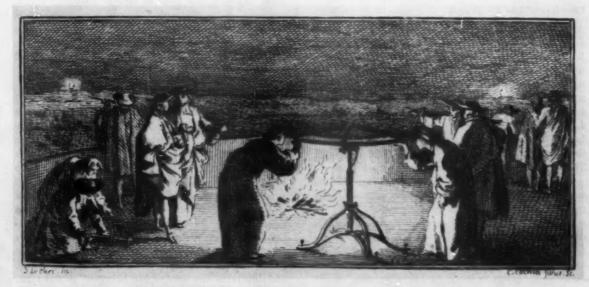
When we turn to the mapping and land surveying instruments of Book IV, we again note the persistence of earlier efforts to avoid burdensome computations. Thus, the "surveyor's cross" — two sets of sights at right angles mounted on a "ferrel" (i.e., for attachment to a staff) — is described as an instrument

for dividing a property into right triangles for measurement. The compass was preeminently the "traversing instrument" and, in England, Leybourn, in his Compleat Surveyor of 1653, had described the modern method of determining whether such a traverse of the boundaries of a field "closed." The surveyor's cross was also a useful device in such work, for boundaries occupied by walls or fences could be "offset" to favorable ground for measurement. Nevertheless, the modern method of computing areas, although published in 1724, only slowly came into use.

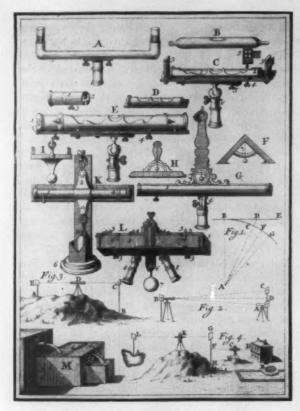
Similarly, in describing mapping methods, Bion notes the planchette, or plane table, and his theodolite is essentially a device limited to recording horizontal angles graphically on sheets of cardboard set into the horizontal plate of the instrument. Apparently there was little or no demand for the further development of Digges theodolitus with its vertical and horizontal scales\* which are characteristic of the modern engineer's transit. Stone adds a description of the "English theodolite" but this is purely a horizontal angle measuring instrument. It was an increasing interest in programs of national mapping which involved large scale triangulation, in short, geodetic surveying, that led to the further development of Digges device in Roy's great theodolite of 1785, and, in the early 19th century, to its simplification in the American "engineers transit." Two major instrumental advances, however, are to be noted in Bion's book:

"DeMarchi to Digges," Consulting Engineer, April 1960

the use of telescopic in lieu of earlier open sights;



Picard's enormous quadrant, with more than a 3-ft. radius, in use at night with signal fires marking the triangulation stations.



Leveling instruments; water level (A); air lock (B); spirit levels (C, E); plummet level (G); balance levels (K, L).

and the emergence of the modern "spirit level" as a basic leveling device.

#### **Development of the Transit**

As is so often the case in scientific developments, the first worker to use the telescopic sight is uncertain. Jean Picard (1620-1682) used it for the quadrant with which he triangulated from Paris to Amiens (about 70 miles) in 1669. Both Bion and Stone describe telescopic sights attached to their theodolites, the latter using two such sights. The sighting of these instruments thus was rendered far more exact, but the problem of graduating a scale to permit the angle so defined to be read with equal accuracy still remained. The earliest was the diagonal scale of transversals.

The diagonal method, in effect, simply spreads the smaller divisions over a wider width of scale, thus making practicable more exact readings both of straight scales and those of quadrants and other angle devices. As Bion notes, "What we have said as to the Divisions of the Quadrant, may likewise be applied to Theodolites, Circles, Semi-circles, or any other Portions of Circles to be divided into Minutes." However, there was obviously a limit on the smallest seg-

ment into which such scales could be divided, and only an arc of large radius could be divided closely. The astronomer Tycho Brahe (1546-1601) had been able to read angles to 10 seconds on his great quadrants. Picard, to make effective use of the same device, used a quadrant of 38 pouces, or over 3-ft radius.

In 1542 a Portugese worker, Pedro Nunez, or Nones, or Nonius, had devised another method, known as the nonius, which ultimately led to the development of the modern vernier by the French worker, Pierre Vernier in 1631. Although the nonius appeared in several modified and somewhat simpler forms, it was not, apparently, a widely or generally accepted device. Stone mentions it in his "supplement," but even the vernier does not seem to have found early application, for it is not noted by Bion. Thus, the famous Ramsden theodolite, which General William Roy of the Royal Engineers used in 1787 to connect the French and English triangulation systems, had a 36-in, diameter horizontal scale that was read by micrometer eyepieces. It was not until 1831 that William J. Young in Philadelphia produced the modern American transit, and the vernier found a major use in surveying instruments in the U.S. and Europe.

#### **Measuring Distances**

In the measurement of distances Bion shows a chain and a bundle of marking pins. It was an English clergyman-professor, Gunter, however, whose famous chain of 66 feet with 100 links, devised about 1620, replaced the earlier "chayne" of Rathborne and remained the standard land measuring device until the later 19th century. Gunter also, it should be remembered, gave us the basis for the slide rule; shortly after the invention of logarithms, he devised "Gunter's scale," a logarithmic scale, or "line of numbers," which, stepping off lengths with a pair of compasses, could be used to multiply and divide. A further aid to graphical calculation was made in the two-rule, or sliding form, by Oughted, a couple of years later, as noted in Stone's supplementary comments.

#### **Leveling Instruments**

In sharp contrast to the slow improvement of portable angle instruments, it is quite clear that by the early 18th century leveling instruments had been devised in practically their modern form. Book V of Bion's treatise describes a "water-level" of the type which Hero of Alexandria had noted centuries earlier, but which had, apparently, been long forgotten. It was made of a brass tube about 3-ft long, with glass tubes joined to its upturned ends "with wax or mastick." Bion notes that, "although very simple, it is very commodious for leveling small distances." He likewise shows the early and popular balance type of level, and illustrates "the level of Mr. Huygens" of this type, with a telescope some 15-in. or 18-in. long. The bal-

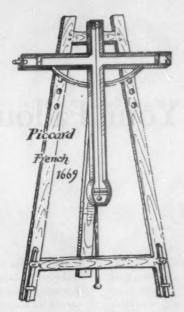
lance level's ultimate refinement Picard's plummet level of 1669, can only be described as the most extraordinary surveying instrument ever devised. Here a vertical case protected a long plumb bog from the wind, while a telescopic sight with a horizontal hair provided for accurate sighting. This clumsy device, with an attached circular arm for leveling, was mounted on an artist's easel. But Bion also shows what he calls an "air-level," a spirit level of modern form.

The invention of the level tube usually is attributed to Melchisedech Thevenot, a French traveler and amateur scientist, who described this device in 1681. Bion says, "The Air-level is a very straight Glass Tube, everywhere of the same Thickness, of determined Length, and Thickness in porportion: being filled to a drop with Spirit of Wine, or other Liquor, not subject to freeze, the Ends of the Tube are hermetically sealed." The combination of this device with a telescopic sight and mounted on "a three-legged staff" provided, in practically fully developed form, what is known today as a dumpy level. It had been described at least as early as 1702 by a French military engineer, Alain Manesson Mallet.

It is to be noted, however, that the curved bubble tube was yet to come. Bion states, "When this instrument is perfectly level, the Bubble of Air will fix itself just in the Middle, and when it is not level, the Bubble of Air will rise to the top." But as another author (Sturm, 1715) notes, the bubble was "erratic in its movement," as it would be in "a very straight tube," and this probably delayed its immediate wide use. In 1722, Leybourn, an English surveyor and author, de-

scribes another form of spirit level — what we now would call a "spot" level — as "a circular flat Box, covered with a Glass cover ground Concave." The modern curved level tube followed.

It also is interesting to note that Bion discusses the adjustment of balance and spirit levels. He advises sighting a rod with the instrument leveled-up,



Picard's remarkable level, with a plumb bob and a sighting telescope.



Mallet's spirit level, the predecessor of the dumpy level in use today.

then reversing the device and again leveling-up, and correcting the telescope or level tube to sight a point half-way between the first two. This involved sights that could be used in both directions, and he notes that some instruments were provided with two reversed telescopes to meet this need. Adjustment finally was simplified in the "wye" form of level, usually attributed to an English instrument maker. William Sisson of London.

#### ... Where Credit is Due

There seems to be little doubt that, in contrast to a lack of demand which discouraged a further development of Digges theodolitus, this interest in and early development of leveling instruments was inspired by the need for more accurate surveys in connection with the low slopes of canals and the water supply constructions of the day. Thus Chezy made a study of available leveling devices in 1768 when he was working on two projects of this type, which also led to his development of the famous formula for stream flow that still bears his name. It also is interesting to recall that the first levels run for the Suez Canal showed a great difference in level between the Mediterranean and Red Seas, which later surveys proved did not exist.

Thus Bion's treatise, interesting and long standard as it appears to have been, reveals but part of the story of the evolution in surveying instruments which was under way in the 18th century. Nevertheless, Bion was accused of plagiarism for failure to give credit to those who had devised the instruments, the construction and use of which he describes. Plagiarism clearly occurs when an author fails to credit another from

whose works he quotes. Bion professed only to describe the construction and use of instruments. He did not attempt to outline their history and development. Thus, if it is true, as has been said, that the author who selects his material from the work of many is a "researcher" we must, in all fairness, admit that the King's Instrument Maker deserves this modern title.

## How Safe Is Your Fallout Shelter?

FAMILY FALLOUT shelters have gained new signifi-

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cance in recent months. For the past 15 years, the doctrine of massive retaliation has kept the cold war from

thawing, and this probably has been the deciding factor in keeping this country free. However, now that our enemies have built up a retaliatory strength, probably equal to our own, the ability or inability of the nation to withstand atomic attack has taken on a new significance. If Russia or Communist China should decide that they are better prepared to survive such an attack than we they may chance a war. The doctrine of retaliation will have lost its deterrent affect.

We know that Russia is taking her shelter construction program seriously. Documentary evidence given in 1959 in House Report 300 indicates that the USSR requires all new construction to have an approved shelter. There is other evidence that Russian industry is moving underground, or being widely dispersed. As both we and the Russians know, a nation consists of individuals. If it is to survive, a reasonable percentage of those individuals also must survive.

#### Civil Defense vs Public Apathy

Prior to the latest Berlin crisis, the American people were apathetic about family shelters. Probably more than one factor contributed to this apathy. For one thing, there is the element of cost. Most people feel that an adequate, underground concrete shelter would cost between \$2000 and \$3000, and they are most unwilling to gamble this sum on the chance that there will be an atomic war. Secondly, they seem to have an attitude of resignation, a notion that if atomic war should come, they wouldn't stand a chance anyway — so why bother? In the face of this apathy and indifference, the Office of Civil & Defense Mobilization has had some tough sledding in its efforts to arouse serious interest in shelter construction.

In June 1959, the Office of Civil Defense & Mobilization released its official Bulletin MP-15 entitled

"Family Fallout Shelters." Although it describes several types of fallout shelters, the bulletin features a doit-yourself shelter designed for construction in a corner of an existing basement. This shelter, measuring 7 feet by 8 feet, is made up of 8-in. concrete block walls. The roof consists of two layers of 4-in. thick concrete block supported on 1-in. board placed over 2-in. by 6-in. beams. Unfortunately, it barely is able to support the weight of its own roof.

#### **Fallout Shelter Fantasies**

Still, this shelter has been touted by the Office of Civil & Defense Mobilization because of its reported low cost of about \$700. However, neither blast nor fire has been considered. If the shelter is located near the target area, it could well become the owners' death trap, for he easily could be crushed by the collapse of the roof, or burned in the ensuing fire.

The chance that the shelter owner will be near the target area is now much greater, since Russia has amassed a growing stockpile of atomic weapons and can thus select more cities as target areas. This means that construction of inadequate fallout shelters on a large scale might decimate our population through fire and blast affects. Although the OCDM bulletin admits that its do-it-yourself shelter is suitable only for remote rural areas, it still is being promoted in large cities. These city owners live with a false sense of security somewhat akin to that of the jet fighter pilot who depends on a parasol instead of a parachute to save his life if he is shot down.

#### Cost vs Effectiveness

Practical builders often demonstrate a sixth sense of structural soundness. Recently, such a builder was asked to construct one of the official OCDM fallout shelters. After studying Bulletin MP-15, he remarked, "This thing is no good, it won't hold up." But, not only is the official shelter lacking in structural qualities, it also is lacking in other basic requirements for

#### JOHN R. SNELL, John R. Snell Engineers, Inc.

in collaboration with Walter A. Snell

survival during a nuclear attack — water supply, waste disposal, ventilation, and fire protection.

While there is little doubt that its shelters were designed by OCDM to meet the public objection to high cost, it is rather obvious that they are inadequate in every respect. Therefore, a clear need exists for a shelter which is not only economical, but adequate, and which can be built on a do-it-yourself basis.

In June 1959, when Bulletin MP-15 was released, the Office of Civil Defense for the State of Michigan asked the author to criticize the shelter, and, later, to prepare — on a public service basis — an alternate, improved design of the do-it-yourself basement-type family shelter. The resulting new design offers considerable protection from fire and blast. Furthermore, radiation and fallout protection is increased substantially because a thicker roof and walls are provided.

The new design also provides realistically for a safe and ample water supply, and an economical method of waste disposal. Air is drawn in through

filters from outside the building, and natural light is brought in through mirrors in the air ducts. Even though it is more efficient, this alternate design is considered to be only an improvement — not the ultimate of a shelter design. In fact, it was hastily put together simply to demonstrate that better designs are possible in a comparable cost range. A local contractor estimated that the OCDM shelter would cost about \$700, while the

improved shelter would cost about \$800. In addition to better design, the improved shelter includes a metal-clad fire door valued at about \$100.

#### Recommended Shelter Designs

It is strongly urged that there be three or four basic types of recommended shelter designs ranging from Type 1, providing protection from fallout only, through Types 3 or 4, providing maximum blast and fire protection. The cost of Types 3 and 4 would probably range between \$2000 and \$2500. Further, it is believed that each type should be designed for:

¶ Use solely as a shelter for new construction. ¶ Dual purpose use for new construction.

¶ Construction in an existing basement.

¶ Do-it-yourself construction outside and adjacent to an existing basement.

¶ Above ground construction outside an existing house in wet areas.

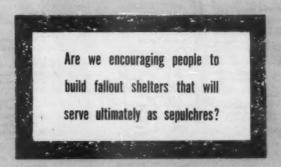
¶ Below ground construction outside an existing house in wet areas.

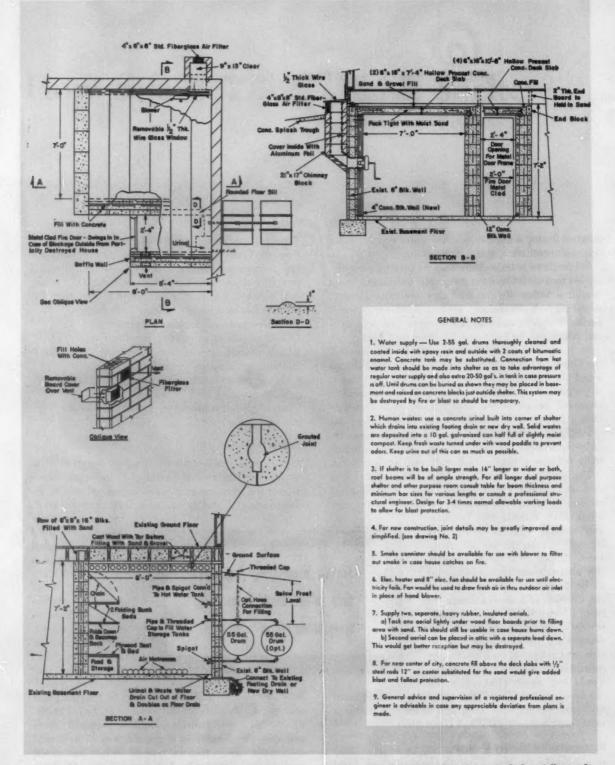
#### **Shelter Selection**

Although this may entail the detailed design of 25 to 30 different shelters, it would give individual home owners the technical know-how and design criteria for constructing a shelter to meet their specific needs

and budget. Only when provided with this detailed information can the average citizen determine what degree of protection he wants to give his family, and what price he is willing to pay. It is suggested that bulletins which

fully describe each of these shelters be prepared and sold at cost. In place of the widely distributed Bulletin MP-15, a new bulletin should be prepared which will describe shelters in a general way. This would aid people in selecting the type of shelter best suited to their needs. It also is recommended that a bulletin describing shelter outfitting be prepared and sold at





Family fallout shelter designed by John R. Snell, Engineers, Inc. has important advantages over present

OCDM do-it-yourself design. It includes fallout, fire, and limited blast protection in existing basements.

cost. This should enumerate and describe in detail all the additional facilities required in shelters, such as water, sewage, light, air, supplies, sleeping accommodations, reading material, food, and protection from fire and blast. Thus, when any citizen reads the free bulletin, and purchases the special informational bulletin and one structural bulletin, he can build a shelter admirably suited to his needs.

The general free bulletin should list and tabulate the prime factors that will determine the degree of protection each home requires in a nuclear war. A simple rating scale for the home owner might be developed on the basis of:

¶ The quantitaive supply of enemy bombs expected.

Size and importance of the city in which he lives.

¶ Location of the city with relation to the coast line.

¶ Distance of the home from the center of the city. ¶ Distance of the home from industrial targets.

From such a tabulation, the individual should be able to select his own odds on survival, just as he determines his income tax from the income tax tables. The use of this new approach would be a considerable improvement over the alternatives given in the present Bulletin MP-15, which, if followed, provide an inadequate fallout shelter.

#### The OCDM Approach

Until three years ago, the major defense recommended against nuclear attack was the evacuation of urban populations to rural areas. After spending millions of dollars to develop detailed evacuation plans, OCDM concluded that these plans were impractical. The main drawbacks were:

¶ Lack of warning time in case of attack.

¶ Massive traffic jams which would result from panic. ¶ Lack of needed fallout shelters in rural areas.

Lack of needed fallout shelters in rural areas.

¶ Lack of facilities to handle large numbers of people. When OCDM abandoned this program, it concentrated on fallcut shelters, emphasizing family fallout shelters as the best means for national survival. However, it is apparent that this government agency, like many other Federal agencies, lacked flexibility, oversimplified the problem, and committed itself to a course which could well pile us on the rocks. It is difficult to discover the reasons for this dangerous course, but it is my feeling that the prime reason is the fact that OCDM has done both its own basic design and checking, answering to no one. Consequently, outside criticism tended to bog down in red tape, and inferior ideas and inferior designs, once accepted, were hard to discard in favor of superior ones.

A recent executive order by President Kennedy called for a shift of many OCDM responsibilities to the Defense Department. This means that much of the future work in fallout shelter design will be carried out, or contracted for, by the Corps of Engineers. In addition, Congress already has appropriated a post-

war record of nearly \$300 million for continued civil defense planning. Thus, with increased funds and more experienced backing, we may look for a vast improvement in the shelter program. The OCDM itself eventually will become the Office of Civil Defense, functioning primarily as an advisory agency on the national, state, and local levels.

It is my recommendation that OCDM, or its successor, employ three well-qualified consulting firms; assign to them the entire national civil defense problem, and impose a time limit of six months to produce both the over-all program of family shelters and the basic data for the various bulletins discussed. Up to the first stage of design, these consultants should act independently. Then they should confer with OCDM and each other to determine the best final approach. Entering into the second stage of detailed shelter design, they should follow the same procedure of design, conference, and final design selection in order to arrive at the best and most economical shelters, each designed to suit one of the six previously outlined general conditions.

#### Consultants Help Highway Design

This approach was extremely effective in the interstate highway program. The state highway departments, unable to handle the increased design load themselves, employed large numbers of independent consulting engineers. The increased efficiency was dramatic, and the experience gained by the various state highway departments and the Bureau of Public Roads turned out to be very enlightening.

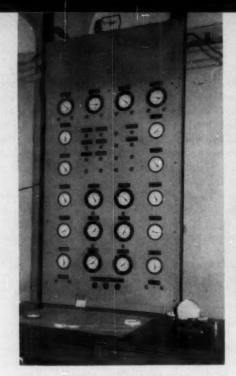
In many states the consultants asked the highway departments, "Why do we have to design the bridge in this manner? What is the reason for this approach? Generally, the reply indicated that design was always done this way—why change? Had only one consultant been employed, the stock answer probably would not have been challenged. However, because many consulting firms were employed, and because most of them asked the same questions, the highway departments finally realized that their design had become stagnant. It is safe to conclude that, with few exceptions, designs produced through our American system of free enterprise—which encourages creative thinking—are superior to those produced by bureaucratic agencies and socialized societies.

#### Consultants' Role in Civil Defense

It is imperative that our people survive a nuclear war, and it is to be hoped that consulting engineers will take an active interest in solving the problem. They can cooperate with OCDM on design and construction of adequate and economical family shelters, but, even if they do not become professionally engaged in this program, they can lend it personal and moral support. The life they save well may be their own.

# Computers Need Conditioned Air

P. A. GREEN & J. E. ROBBINS Pope and Evans





COMPUTERS are assuming a dominant role in our

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technology, as more and more applications are found for them in defense, research, and private industry. This

increasing range of computer uses includes such diverse tasks as the simple storage of inventory records and the highly complex launching and guidance of an anti-missile missile.

While computer applications may be diverse, one requirement remains common to all installations. For successful use, a predetermined and controlled environment must be provided. Variables such as air temperature, relative humidity, air cleanliness, and air distribution affect the computer operation and must be controlled between prescribed limits, depending on the specific application.

The successful application of a computer requires that the probability of failure of the machine or its components be reduced to virtually zero. Unscheduled down time can cause the loss of vital information. Furthermore, the large investment requires that maximum use be made of the computer if it is to be operated on a practical basis. In many defense applications, the cost of an unscheduled or uncorrectable computer outage could be incalculable; the results of such an outage could well be disastrous.

#### **Conditioning System Types**

Two basic types of systems are used for computer air conditioning: the open, or indirect system; and the closed, or direct system.

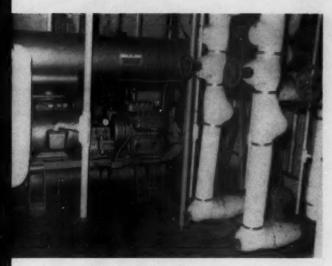
In the open system, a conventional commercial air conditioning system maintains room conditions within prescribed comfort limits. This type of system is used typically for computer installations of 100 kw or less connected electrical load, which normally require only an externally controlled environment.

With this system, the conditioned room air is drawn into each frame or cabinet section of the computer by a built-in circulating fan and air distribution system, furnished by the manufacturer of the computer frames. The used air is exhausted to the room. For those cabinets with low kilowatt loads, heat is removed by convection, and the exhaust fan is omitted. This system normally will include a rollomatic type prefilter, a high efficiency afterfilter, a bypass controlled chilled water coil, and a reheat coil. This combination of components is sufficient to provide a clean atmosphere where temperature and humidity are checked and regulated with narrow limits.

The second type, the closed cooling system, found at large computer installations, includes both a direct air distribution system to the computers and a controlled room environment.

Experience indicates that either the direct or indirect system should be independent of other building air conditioning systems, and that additional precautions for fire prevention should be included. Noncombustible materials should be used throughout the computer air conditioning system (insulation, vapor barriers, sound insulation linings, coverings, adhesive, sealers, filters, and refrigerants).

Air is passed through rollomatic prefilters before the standard high efficiency filters. Prefiltering reduces both operating and maintenance costs of the more expensive high efficiency units. This conditioning sys-



The control panel board (left) and piping to the chiller and condenser (above) for a large computer installation.

tem is typical of those normally used for smaller computer installations up to about 100 kw.

#### The Indirect System

Fig. 1 illustrates the air flow in an air conditioning system for an 1BM 7070 computer installation. The equipment is partially transistorized, producing approximately 40 kw in heat emission. Operating experience has shown that the computer room must be maintained at 35-65 percent relative humidity and 70-80 F dry bulb temperature. A face and bypass system with reheat and a winter pan humidifier were chosen for this system. The bypass system produces a lower relative humidity under partial loads and minimizes the amount of steam needed for reheat.

This computer, used for military inventory control has an emergency connection to the personnel comfort system in case the computer's air supply system should fail. This connection gives the computer conditioning system a 100 percent stand-by capacity, which is consistent with military reliability requirements. The chillers for the separate systems are so valved that either one can provide the chilled water for the computer system. Condenser cooling water is provided by a single cooling tower designed for year-round operation. In addition, emergency connections to the city water system are provided as a stand-by.

#### **Combined Direct and Indirect Systems**

The computer installation in Fig. 2 is part of the U. S. Air Force early warning system. It includes a detection and tracking computer, and display and communication equipment. Because of the importance of these

installations, duplicate computers are installed to operate simultaneously — one computer acting as the master; and the other, the slave. If for any reason one computer should fail, the other could take over and handle the job alone.

The heat load for each computer is in excess of 600 kw. However, since the equipment is scattered among many different cabinets, it is possible to provide individual treatment for each component, according to its proportional heat load. Cabinets containing critical equipment are connected directly to a conditioned air supply. Other cabinets include simple intake fans, which draw conditioned room air into the cabinet and provide adequate cooling. Still other cabinets, containing equipment with very light heat loads, can be cooled adequately by normal convection.

The biggest cooling problem is with the power supply cabinets, which operate at higher temperatures than the rest of the equipment. The air drawn through these cabinets is exhausted directly back to the conditioning equipment instead of into the room. In this way, the room sensible heat load is reduced without increasing the total refrigeration load.

One of the problems encountered in the above installation is the difficulty of relocation or addition of individual computer frames. Each time an existing computer frame is moved, or a new one is added, the supply ductwork must be revised. This limitation has been overcome to a certain degree by a modified system which uses an underfloor supply plenum. This plenum receives conditioned air at a static pressure of 0.3-in. wg. Adjustable orifices (Fig. 3) are inserted in the floor at the frame locations. With this system, the relocation or addition of a computer frame involves only the insertion to a new orifice into the floor and the sealing off of the old one.

In the installations just described, extensive balancing is necessary to provide the design air supply at each frame. In addition, whenever maintenance work requires opening a cabinet, air delivery to the adjacent equipment is upset. The reduced resistance in the open rack causes an increase in flow through it, and reduces normal flow to the other units.

#### **A Direct System**

A computer for a missile system requires an extremely complicated air distribution system. The cooling load varies, not only from cabinet to cabinet, but also from one section to another in the same cabinet.

To solve this problem, an air supply plenum and a return air plenum are added to each cabinet. The plenum, 2½-in. deep and 30-in. wide, is designed to maintain a 1-in. wg static pressure. Air flow to each rack, or section of the cabinet, is regulated by a series of orifices between the air plenum and the racks (Fig. 4). The design pressure drop through the orifices is more than 80 percent of the total external discharge

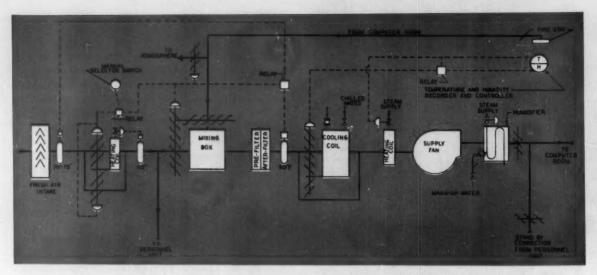


Fig. 1 - The air flow in an air conditioning system for an IBM 7070 computer. The equipment is partially transistorized.

static pressure of the system. Thus, the flow to any rack is a function of the number and size of orifices.

#### Design Requirements . . . Temperature

Temperature is the most critical of the several parameters that affect computer reliability. Large variations in temperature change electrical values, introducing errors into the system. The lives of transistors and other electronic components are shortened when they are operated at elevated temperatures. Most computer manufacturers specify design limits ranging between 60 F and 90 F, and narrower operating limits for specific components.

Experience has shown that a supply air temperature of 60 F to the computer and a room temperature of 75 F is satisfactory. Incidentally, 75 F is an acceptable year-round temperature for both personnel comfort and computer operation.

#### ... Relative Humidity

Relative humidity also must be controlled within certain prescribed limits for successful computer operation. At high relative humidities, electrical charges will leak between components and introduce errors into the computer. Judged solely on this characteristic, low relative humidities would seem to be desirable. However, low relative humidities encourage annoying static discharges between the operating personnel and room furniture — causing noise and computer error.

The extremes of humidity also affect the physical characteristics of the tapes that are used to receive, store, and feed information. Although computer manufacturers' recommendations vary from a 50 to 60 percent requirement to a permissible range of between 20 and 80 percent, our experience suggests that a

relative humidity range of 35 to 65 percent is satisfactory. This range may require modification to closer tolerances for specific applications.

Another significant consideration in the relative humidity requirement is the initial cost and complexity of the refrigeration system. As the design relative humidity is decreased, the dew point is lowered, and as the dew point approaches values of 40 F and lower, protection against freezing may be required. Instead of chilled water, a glycol solution would be required, and, since frost can be expected

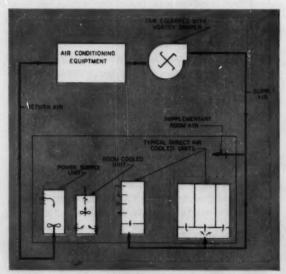


Fig. 2 — Combined direct and indirect conditioning systems for an Air Force early warning computer installation.

on the cooling coils, defrosting must be included in the design. (Glycol or other antifreeze sprays should be avoided in computer installations, since the potentially corrosive glycol vapor may have an adverse affect on the computer.) Also, as the dew point is lowered, the refrigeration machine must be operated at lower suction pressures. This increases the cost of refrigeration and necessitates a larger power source.

Consquently, the choice of a design relative humidity must be weighed carefully, and design conditions should approach the high limit of acceptable ranges.

#### ... Cleanliness

A successful computer operation requires a clean environment. An accumulation of dust can result in faulty computer operation. On all computer projects it is desirable to include both a prefilter and a high efficiency afterfilter. Our experience has shown that this combination tends to reduce maintenance costs, minimize operator requirements, and maintain the desired cleanliness in the computer area.

#### ... Fire Protection

Fire protection and detection are prime considerations in the design of the computer installation, and non-combustible materials should be used in the air conditioning system and surrounding area. If this is not possible, an automatic fire extinguishing system should be provided to protect the computer area. An automatic fire detection system, actuated by either the products of combustion or rate of rise detectors, also is necessary. All precautions taken to make the installation fireproof are warranted when the cost and consequences of an outage are considered.

#### ... Continuous Operation

An air conditioning system for a computer installation must be designed for year-round operation. During periods when outside temperatures are low, operating costs can be reduced by cooling with outside air. Though such a system is complex and requires additional automatic controls, cost comparison will justify the added capital investment.

Since a computer system must run continuously, maintenance must be possible without interrupting service. The equipment selected must be rugged, bearings and v-belts should be oversized to extend their operating life, and spare parts must be available.

#### **Manufacturer-Engineer Coordination**

The air distribution system is of prime importance in the design of a conditioning system for a computer installation; air requirements for this application greatly exceed the usual commercial application. Unless special consideration is given to this aspect of the design, the room will be drafty and the cause of employee complaints — or the computer will be improperly

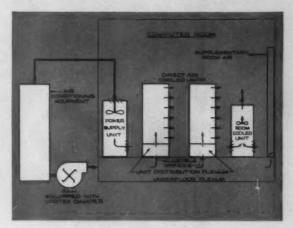


Fig. 3 — A modification of the underfloor plenum system makes the addition or relocation of cabinets much simpler.

cooled. It is in this area that greater cooperation between the design engineer and the computer manufacturer is needed. Too often the manufacturer and design engineer operate independently. The air distribution system should be designed as in integral unit, coordinating the external air distribution system designed by the air conditioning engineer and the internal system designed by the computer manufacturer. This is particularly important in larger computer installations. Such cooperation would minimize difficulties of air balancing, reduce a number of equipment duplications that form a part of the air distribution system, and provide better operating conditions.

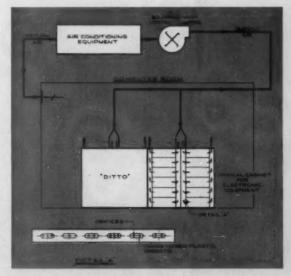
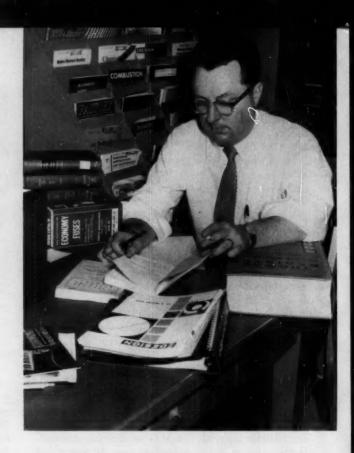


Fig. 4-A supply air plenum and a return air plenum are makes the addition or relocation of cabinets much simpler.

# Make Your Library Investment Pay Off

MRS. GLORIA EVANS



THAT DAY IS GONE when a few handbooks and text-

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books could serve as adequate resources for engineering research. New methods and materials continue to

complicate an already far from simple picture; to-day's practicing engineer cannot do an efficient job without access to a large variety of technical data. Some 100,000 business and technical journals currently are being published. In 1960 alone, enough technical papers were produced by the world's laboratories and research centers to fill 60 million pages — the equivalent of 465 man-years of around-the-clock reading. Hidden away in this mass of literature are thousands of cost-saving ideas, processes, and procedures, most of them lost to the firm or individual who tries to operate without some organized method of information classification and retrieval.

There is little doubt that a large percentage of lost engineering time can be traced directly to this problem of information retrieval and technical research. Too many hours are spent looking for facts that should be readily available. Countless hours are spent finding the answers to problems that already have been solved. (An electronics firm recently spent \$200,000 and five years on a certain problem, only to find that the answer had been found, and published, by a Russian group some time before.) Too often, busy associates are called from their work to help find material that could be centrally located for use at a moment's notice.

However, despite the evidence of inconvenience in chaos, many engineers and their office managers view libraries and information centers as costly and unnecessary frills, useful perhaps for the larger corporation, but of little value to the smaller firm or the individual consulting engineer.

#### **Your Present Situation**

Contrary to general belief, the establishment of a small engineering library is neither complex nor expensive. Most engineers have the nucleus of a good library in their desks. Reprints, books, pamphlets, manufacturers' literature, tear sheets, magazines, notices of meetings, society proceedings, and conference materials all find their way into desk drawers, filing cabinets, and office bookcases. The result? Numerous collections of unorganized miscellany, occupying valuable space, and difficult to sort when a particular item is needed. Why subscribe to two or three copies of a magazine, when one copy, properly checked in and routed, will suffice? Why order a second copy of a book when the copy purchased a month ago lies unused in someone's desk? Where is the value in each engineer trying to maintain his own collection of manufacturers' data? Books? Standards? Codes? By acting as a clearing house for all types of literature and consolidating its purchase, a library eliminates duplication; saves time, money, and space; and, most important, provides vital information quickly.

The following services would help free many engineers and other technical personnel for more creative and productive work for the firm:

¶ A centralized filing location for project reports, standards and codes, drawings and specifications, and job folders, with a complete index to each file.

Product literature indexes as an aid to estimating and specification writing.

¶ Planned distribution of books, magazines, and other library materials.

¶ Technical research and information retrieval.

¶ Current information on local and national events of professional, educational, and technical significance.

#### Where to Begin

Information collections grow rapidly; careful planning in the beginning will help avoid expensive reorganization later. Regardless of the size or scope of operation, the following basic plan will help in the organization of any library:

If possible, hire a qualified librarian. This may cost a little more in the beginning, but eventually it will pay. The numerous details of library organization, which could produce a stumbling block for the inexperienced clerical worker, will cause little concern to a professional librarian. He knows how to ferret out and organize existing materials, and where to obtain new and better materials. However, if the firm is small and unable to afford a professional, at least choose an enthusiastic person who likes people, and has initiative and an inquiring mind. A misfit in any other job will still be a misfit in the library.

Select a good location. Frills are not necessary. It has been proven many times that the smallest library, advantageously located and simply furnished with a desk, a telephone, a small collection of reference books,

#### THE ENGINEERING LIERARY

Annual reports Archives Bibliographies Blueprints Books Buyers' guides Charts Clippings Codes and standards Correspondence Films Graphs Job folders Magazines Manufacturers' literature Manuscripts Maps Microfilm, microfilm strips Newspapers **Pamphlets Patents** Periodical indexes Plans Photographs Preprints and reprints Reports, internal Reports, other companies Slides Society proceedings Specifications Telephone directories Theses and dissertations Time tables (airline, train, bus, etc.) Trade catalogs, brochures University brochures

All the items in this list have a place in an engineering library, and are much easier to find when kept there.

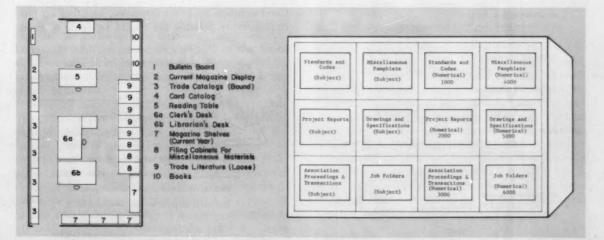


Fig. 1 - Layout plan for a typical firm library. Each section is easily accessible. The file drawer section shows

a suggested system for miscellaneous items. The layout is flexible, to meet the individual needs and capacities.

| 10 s              | SHEEMSHAM LIBRARY  |                    |
|-------------------|--|--------------------|
|                   | Won't you please help us by reviseing this, ofcommenting or think will be of interest to our Engineering | a any articles you |
|                   |  |                    |
| Should this or    | rticle be referred directly to enyone!   | Page:              |
| Should this er    | rtials be referred directly to asymmet   |                    |
|                   |  |                    |
| Front this ar     | rticle be referred directly to asyone?   |                    |
|                   | issue did you notice may other publications of<br>her, title, page) Comment on book's value,             | interest?          |
| Other Publication | Named That Should be Ordered, i.e. Standards i   | Coles, Pennilets   |
|                   |  |                    |

Fig. 2 - A standard form should be made for requesting individuals to review particular articles for the library.

| WHAT'S IN THE ENGINEERING  | LIBRARY?   |
|--|------------|
| NEW If you are fatercoated for any of these extistion, of safety and are resource this of the father are.  | rooding    |
| ARCHITECTURAL RECORD (N. Orubb)  |            |
| <ol> <li>"Personnel Dunsity, A Now Measure of Construction Costs", peer 135.         A discussion of the relationship between cost and monker of occupants for a building of given size and the added costs for methanical and electrical service as the occupancy is changed from outchwood gas teamerstoruling operations.     </li> </ol> | (Nurch)    |
| CIPCIAL SOR OL Person  |            |
| 2. "Lined Values Peas Youte in Plant Service", peas 99 Report on the increased use of plantic-lined values in the abstrain process industry.   | (April 15) |
| DOT DESCRIPTION OF REPORTS   |            |
| <ol> <li>"installation Costs", page 6         Estimating cost for "installation" of belt conveyors, boilers, bushes observance, centrifugal pumps, centrifugas, crystallisars, drysts, dust collecting equipment, motors, filters, gas producers, fastrements, insulation, non embanges and lyting.</li> </ol>                               | (January)  |
| MATTER PERSON & ALE CONSTRUMENTS. (8), LABORATES.  |            |
| <ol> <li>"What You Should Enser About Thermoslastic Pining Systems", page 128         An embysis of plastic pining which presents: (1) Einds in common use, (2) their chemical resistance, (3) their physical properties and (6) how to apply thom.     </li> </ol>  | (Merell)   |
| <ol> <li>"Coal What Every Regisser Should Knop", pass 155         Compositions, classifications, beating valves and other facets         of sub-bituminous, bituminous and enthrects coals are presented         in question and answer form.     </li> </ol>  | (Apr'11)   |
| Deposit Hillist (F. Nac Joseph   |            |
| <ol> <li>"Unginering or Research", some 100         The working beninground for ongineers aspiring to messagement in underlined in these pres and some valuable to the ongineer being "recognized in messagement".     </li> </ol>   | (Sarch 16) |
| Lest   |            |

Fig. 3 — The reviews and comments in answer to the form in Fig. 2 can be collected and printed for circulation.

and an enthusiastic custodian, will function far more effectively than an elaborate one hidden from view.

¶ Make a list of all subscriptions to magazines and other publications (transactions, proceedings, and reports received regularly by the organization). Arrange for these publications to be checked into and circulated from the library.

¶ Determine the firm's interests and needs by circulating a questionnaire to all personnel. From the results of this survey, management can decide which material should be housed in the library and what services would be most beneficial.

¶ After tabulating the results of the questionnaire, issue a directive to all personnel. Explain the plan for the library and request that any books, pamphlets, trade literature, or other miscellaneous materials, belonging to the organization and currently in the possession of an individual, be sent to the library for cataloging. (It may be better to stagger turn-in dates, to avoid a flood of material at one time.)

One of the most important details of planning an engineering library is the acquisition of materials. As has been pointed out, the nucleus of most new libraries is material contributed by the engineers themselves. But collecting material into one central location will not make a library. Its effectiveness depends entirely on the way the material is organized for rapid retrieval. At worst, a library can become a dumping ground for unneeded materials — a little-used collection of miscellaneous and surplus data. But it can become a vital asset to the firm, bringing every member into an alert and integrated team.

Small libraries usually find a complex indexing system unnecessary. They merely organize their material in a logical order, indexing it as simply as possible for rapid retrieval.

#### Books

Good technical books are expensive; once they are purchased, every possible use should be made of them.

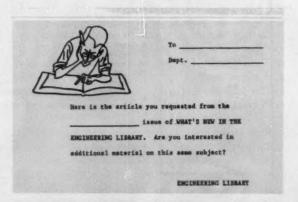


Fig.  $4 - \Lambda$  simple routing slip is convenient for making sure that requested information gets to the right person.

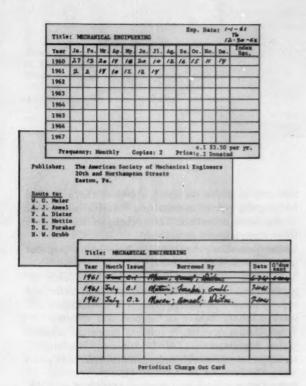


Fig. 5-A circulation card, a file card, and a charge-out card should be kept for each publication in the library.

Pulver, Harry E.

Construction estimates and costs. 3d ed.

Baw York, Netror-Hill, 1960.

Subject: SULLDING--ESTIMATES

Construction estimates and costs.

Pulver, Harry E.

Construction estimates and costs. 3d ed.

New York, Netror-Hill, 1960.

Sullding--ESTIMATES

Pulver, Rerry E.

Construction estimates and costs, 3d ed.

Tow York, Netror-Hill, 1960.

Fig. 6 — Three cards should be filed for each book; one by author, one by the title, and the third by the subject.

When properly cataloged and housed in the library, books are available to everyone. Personal collections are no longer necessary. Additional copies can be ordered if needed, but with the library keeping track of circulation, management is assured that only the most important books will be duplicated.

Book selection should be based on: (a) demand, and (b) the build-up of a basic and functional collection. It should, of course, be governed by the books already available in the organization; these should be gathered together, as the basis of the library's reference collection.

There are numerous aids to new book selection. Excellent book reviews appear in most business and technical journals. The New York Public Library and the Special Libraries Association both publish, on a subscription basis, unbiased annotated lists of new technical books. Publishers usually are willing to send copies of their publications to libraries on approval. (Because good books are not cheap, it is a wise librarian who seeks the advice of an engineer, expert in his field, in helping to determine the value of a book before making a final purchase.)

A record should be kept of each purchase, in order to eliminate order duplication. A simple card file, giving the author, title, and the order date is sufficient. It is also a good idea to note on the order card the name of the person suggesting the book and the names of any others who might be interested. All library books should be marked with the library ownership stamp before being cataloged.

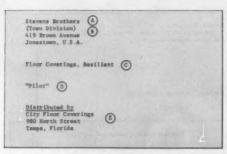
#### **How to Catalog Books**

The most simple classification system is recommended. Use an alphabetical card index filed by author, title, and subject. A subject authority file, i.e., a listing of all subject headings, must be established and adhered to. For example, "Electrical Engineering" cannot be used one time and "Engineering — Electrical" used the next time. The books can be placed on the shelf alphabetically by author, or they can be grouped by subject.

There may be books or other material which would be of more use if kept in an area other than the library. Not every item needs to be in the library, but a record of each item should be, so the librarian will know at a glance who has what.

#### Pamphlets

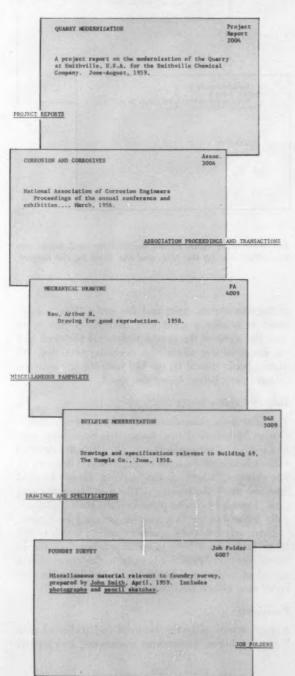
A good source of recent business and technical data is the brochures, government documents, and reports





E Distributor or Vendor

Fig. 7 — A single card (left) can be made out for each manufacturer represented in the files. Separate cards should also be made out (below) for each item in the miscellaneous file, including notes on the contents.



that are available to most libraries. On a limited budget, this type of material is a valuable supplement to the book collection. The techniques for locating these materials are numerous:

¶ Most periodicals regularly list items of interest that have come to their attention.

¶ Technical and professional associations, labor organizations, Chambers of Commerce, and individual experts usually publish the results of their studies and surveys for the benefit of business and industry.

¶ Association newsletters refer to important releases. ¶ The Superintendent of Documents, Washington, D. C., issues a bi-weekly order guide to Selected United States Government Publications (free).

¶ The Office of Technical Services (OTS) of the U. S. Department of Commerce issues a monthly list of U. S. Government Research Reports available to industry (\$6.00 a year). Each issue contains abstracts of several hundred reports, the price of each, and complete instructions for ordering. Detailed subscriptions of reports of special interest to small and medium sized businesses also are found in the Monthly Technical Reports Newsletter (\$1.00 a year), and the Business Service Checklist (\$1.50 a year).

In addition, an effort should be made to persuade personnel to pass on to the library the miscellaneous items that cross their desks every day. Often an informative speech or report, or material picked up at a convention or business conference, is tossed into a drawer or the wastebasket, when it might be useful to others if it were given to the library.

#### Magazine

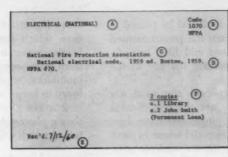
There are several ways of handling magazines, depending on the size of the subscription list and the number of engineers who want to read them.

¶ A simple routing system can be arranged, with each engineer receiving the magazines he has selected.

The table of contents of each journal can be circulated, and engineers can request articles of interest.

The organization can subscribe to one or more of the commercial services that reproduce the current table of contents of several business and technical journals in one list, which can be circulated in the firm.

Fig. 8 – The file cards for each entry in the Standards and Codes file should include the date received and current holdings, in addition to the regular information.



STANDARDS AND CODES

(A) Subject
(B) Assigned number
(C) Author
(D) Title
(E) Date Rec'd.
(pencilled in as new issue arrives)
(F) Library's holdings

One of the best ways to obtain maximum usage from periodicals is to set up a simple reviewing plan. Each engineer is asked to review one or more magazines a month, submitting his commentary on interesting articles, as well as noting any items of specific interest to his associates. The reviews are coordinated into a brief annotated listing for circulation to all personnel.

It is a good policy to evaluate each magazine coming into an organization. The subscription list should be examined periodically for irrelevant magazines. New journals should be ordered when a gap in subject matter is noted. The following check list will help: ¶ Are you receiving all the important periodicals in your field of specialization?

¶ Do you need more than one copy? Are you receiving too many copies?

¶ Are you informed of and receiving all the excellent free technical publications?

¶ Are the annual or semiannual indexes of magazines being filed as an aid to locating articles?

¶ Are back issues of magazines being kept for reference purposes? For how long?

¶ In order to utilize fully the reference value of your magazines, are you subscribing to one or more of the published technical indexes, i.e., Applied Science and Technology Index (H. W. Wilson Company) or the Engineering Index (Engineering Societies Library)?

#### **Manufacturers Literature**

Every consulting engineer realizes the value of manufacturers' trade data, both for general reference and for estimating and specification writing. These data give detailed descriptions and illustrations often unobtainable from any other source. The value increases as each piece of trade literature coming into the office is analyzed for content. Who manufactures stainless steel windows? To whom does this trade name belong? Does this national concern have a local distributor? Who is the sales manager for this organization? In the well-planned library, large manufacturers' catalogs stand side by side in organized arrangement. Loose material is housed in strong folders. Vendors' catalogs are analyzed for the manufacturers they represent. A complete card index, cross-filed by

company name, trade name, local agent, and product classification, ties the entire collection together.

Keeping a manufacturers' file up-to-date requires little effort. Salesmen are eager to help, and on request will make a point of periodically dropping into the library with new bulletins or brochures. If additional material is required, a printed postcard will bring either a complete catalog or a specific bulletin. Superseded material is withdrawn as new literature arrives, and only fact-giving data are kept. It is important that the consulting engineer be kept posted on all the latest products pertinent to his field of work. The library can arrange a simple routing system, and technical literature will automatically take its place as an effective reference tool.

#### Miscellaneous Material

Because they come in so many sizes, shapes, and kinds, miscellaneous items sometimes can be a problem. However, since this material frequently has the most current information on a subject, it is well worth the time it takes to organize it correctly.

A very easy way to handle any miscellaneous type materials is to file them in a numerical sequence and use a simple subject card index as a guide to their content and location. It is usually better to keep material grouped by class. For example, the small consulting engineer's library probably would find itself handling such diversified publications as standards and codes, project reports, association proceedings and transactions, miscellaneous pamphlet materials, drawings and specifications, and job folders. A suggested numbering system is given below. As new

| Class of Material                        | Assigned Number |
|--|-----------------|
| Standards and Codes                      | 1000's          |
| Project Reports                          | 2000's          |
| Association Proceedings and Transactions | 3000's          |
| Miscellaneous Pamphlet Materials         | 4000's          |
| Drawings and Specifications              | 5000's          |
| Job Folders                              | 6000's          |

Miscellaneous material can be subdivided numerically.

material arrives in the library, it should be placed in its class, assigned a number from the predetermined block of numbers, and processed and filed immediately. The card index then becomes the key to the entire collection.

The materials that probably pose the most annoying problem to any library are the less durable items such as newspaper clippings, one-sheet brochures, and tear sheets. If the material seems to have lasting reference value, it is better to reinforce it in some way, either pasting it to a cardboard sheet or placing it in a lightweight cover. The item then is indexed in the conventional way. However, if the material has only temporary value, it can be dropped into a miscellaneous file folder. (This folder should be weeded periodically.)

#### What Does a Library Cost?

The main question in the minds of management when it considers the possibility of establishing an engineering library is, "What will it cost?" Contrary to general belief, the organization of an engineering library does not require a large budget. It is entirely possible to establish functional library service with minimum funds. The initial cost can be reduced, as has been suggested, by starting the library with the collection of material scattered in individual offices. From then on, the annual cost will depend upon the material added and the staff required to carry on efficient library service. In most firms, even the cost of furnishings may be small, since usually there are desks, tables, and chairs in storage, which can be utilized to set up the library

The library should have a budget, and learn to live within it. However, it is difficult to suggest an adequate library budget. Sample budgets serve only as a guide, and one should never be deterred from investigating the possibility of establishing a library simply because the cost appears to be too high. A competent library manager can make even the smallest budget go a long way and still give A-1 service. As a guide, however, it may be of interest to know that the average annual cost of a technical subscription is about \$7.00. Business books average \$7.98; technical books, \$8.09. A great deal of pamphlet-type material is either free, or available at a nominal charge, and of course a wealth of valuable technical information exists in manufacturers' trade literature.

One fact which is not always obvious to the layman is that the engineering library does not need to possess all the information which it uses. Once a library has been organized, a vast store of material is placed at its disposal. By maintaining an active liaison with other engineering libraries, public libraries, university libraries, government agencies, and trade and professional associations, a library will receive regular notices of any events of technical importance which

these organizations sponsor, as well as most publications which they issue. Business and university libraries maintain large files of periodicals, government documents, and patents, which, because of space limitations, would be impractical for the smaller library to keep; most of this material can be borrowed. If it is not possible to borrow the original material, then a photostatic copy or reprint usually can be obtained which will serve most purposes.

#### **Special Libraries Association**

Many firms, while recognizing the need for their own library or information center, hesitate to create one. They are unsure how to go about it, what it will cost to start and operate, and where such a service would fit into their organization. To help these firms, the Special Libraries Association has established a Consultation Service, designed to help any organization — large or small — set up, expand, reorganize, or operate a library or information service.

The Special Libraries Association has 32 chapters throughout the U. S. and Canada. Each chapter maintains a Consultation Committee. Any organization's request for library help will be referred to the Committee servicing its area, and the Committee, in turn, will select a qualified librarian to visit the organization. The librarian will offer expert guidance on costs, techniques, equipment, and staffing patterns; survey existing facilities and offer recommendations; and submit a written report if requested. The service is free (except for travel expenses) if his visit does not require more than one day's time.

If a longer survey is necessary, the Special Libraries Association will submit a list of qualified librarians — any one of whom will be able to offer professional service. The firm then will be able to select its own consulting librarian and contact him directly to determine how long his services may be required. There is no standard fee, so the amount the librarian will be paid for his services depends entirely upon an agreement between the librarian and the firm.

Within the past three years, over 200 organizations have used the Association's free consultations. Any firm requiring information or help can contact the Special Libraries Association, 31 East 10th Street, New York, New York.

#### Conclusion

The benefits from a well-organized engineering library are numerous. Finding even one vital statistic for the right person at the right time may be all that is needed to settle an important problem. The prompt retrieval of a labeled drawing may save a busy technician hours of additional research.

Engineers need good tools in order to do good work, and certainly an engineering library is one of the most valuable tools they can possess.

# For DOWN-TO-EARTH FACTS on GROUNDING...

#### ask ARROW-HART!

To insure safe utilization of electric power, the National Electrical Code now requires the use of grounding devices for many types of installations. As a result, selecting and specifying the proper grounding devices has become a problem of increasing importance for architects and engineers.

A pioneer in the field of grounding, Arrow-Hart produces broad lines of grounding type wiring devices—including many devices developed expressly to meet architectural requirements. Arrow-Hart is a logical source for grounding type wiring devices—and for down-to-earth answers to help solve specification problems.

For knowledgeable assistance with your specification problems, phone the Arrow-Hart Branch Office nearest you and ask an Arrow-Hart Wiring Device Specialist to call. For a clear explanation of the new Code requirements, send now for your free copy of the Arrow-Hart Circular "GROUNDING FACTS." Write today to: Department CE, The Arrow-Hart & Hegeman Electric Company, 103 Hawthorn Street Hartford 6, Connecticut.



WIRING DEVICES . APPLIANCE SWITCHES MOTOR CONTROLS . ENCLOSED SWITCHES

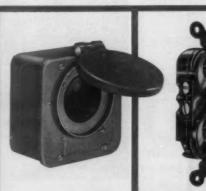
No. 5278-WP: 15 amp., 125 Volt Weatherproof Male Motor Plug Base

Motor Plug Base
For applications such as heater blocks and refrigeration units on trucks as well as other equipment in exposed locations.

No. 5754: 4-Wire 50 Amp., 125/250 Volt Receptacle with 5740 Weatherproof Enclosure Widely used for kitchen equipment, truck docks, dairies and mobile home facilities. No. 5725: 20 Amp., 125 Volt Duplex Grounding Receptacle

Ideal for typewriters, computers and other office machines. Prevents accidental plug-in of lower rated, conventional appliances.







# Cathodic Protection Against Corrosion

E. H. THALMANN Ebasco Service, Inc.

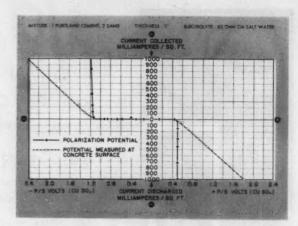


Fig. 1 – Current and voltage relationships of steel cast in concrete (polarization and surface measured potential).

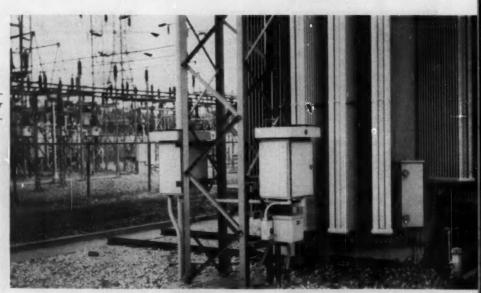
ELECTRICAL SAFETY at power plants during pow-

CF exclusive

er faults on the system requires that the various surface structures be electrically continuous and thoroughly

interconnected. The extensive station grounding grid, consisting of high-conductivity bare copper cable buried at a shallow depth, supplemented by copper ground rods driven into the earth, is bonded to the buried oil, gas, and water piping, as well as to metallic cable sheaths and conduits. This system of interconnected buried metals constitutes a large galvanic cell which aggravates corrosion of the underground structures. Contributing causes of corrosion are local-action cells, which result from such effects as differential aeration, differences in soil types, ion

Cathodic protection rectifiers and transformer at a modern power plant.



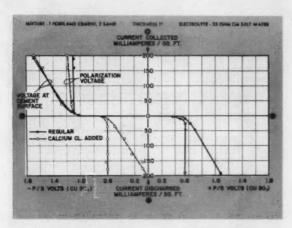


Fig. 2 - Current and voltage relationships of steel cast in type II portland cement (regular and with CaCl added).

Fig. 3 — Current and voltage relationships of bare steel submerged in an electrolyte bath (50 ohm cm salt water).

concentration cells, and electrophoresis. The galvanic cells that result are of particular importance in lowresistivity soils, because the magnitude of the currents that flow may cause severe underground corrosion.

Control of underground corrosion can be economically achieved by combining carefully selected coatings with a cathodic protection system that is coordinated with grounding requirements. The design of the control system should be predicated on a soil resistivity survey and analysis conducted at the time the preliminary foundation investigation is made. Thus, an integrated and economical design can be achieved. The data required for the design of the plant grounding system can be obtained from the same survey if the necessary additional readings are made. However, if the problem is neglected until emergency action is required, costs cannot be easily controlled. Economics dictates that both corrosion control and grounding be provided in the initial plant design.

In the absence of shielding, cathodic protection of underground structures may be obtained from direct current introduced into the earth at a location electrically remote from the station's grounded network of metallic substructures. Where space for this is not available, or where soil is unsuited for the construction of a remote ground bed, distributed and well-type ground beds can be effective tools in the cathodic protection system design.

#### **Ground Bed Design**

Remote ground beds usually consist of either graphite or high-silicon cast-iron anodes installed in carbonaceous backfill. Vertical or horizontal anode configurations can be employed; the choice is dependent upon the manner in which resistivity varies with soil depth and physical characteristics, as well as the type of

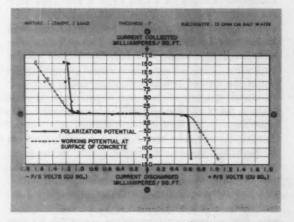


Fig. 4 - Current and voltage relationships of copper cast in concrete (polarization potential and working potential).

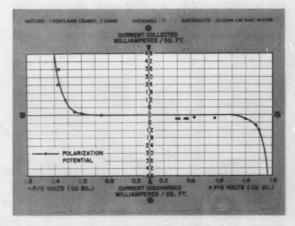


Fig. 5 - Current and voltage relationships of zinc cast in concrete (only polarization potential has been plotted).

construction equipment available. The remote ground bed has its greatest value in providing cathodic protection current for the control of corrosion from longline cells, such as those established between buried steel piping and switchyard copper grounding grids.

Although cursory consideration of the problem generally will indicate the desirable features of distributed ground beds, practical attention to the hazards of such an installation during power plant construction usually tends to favor remote or deep-well type installations. The deep-well ground beds can be designed to supplement protection afforded from remote installation, or they can be designed for specific conditions. In the interests of economy, open-hole, deep-well ground beds are desirable where geologic conditions will permit their construction. Individual anodes should be connected alternately to at least two looped header cables in order to assure continued operation even though a riser cable may be damaged. An insulation break on a riser cable is extremely serious, even at the low voltage at which cathodic protection systems are operated, because current will discharge at the insulation failure. This will cause the cable itself to corrode and fail. Connection of the anodes to alternate riser cables would permit operation of the ground bed in spite of a broken riser.

Natural graphite flakes are a preferred backfill medium for well-type ground bed construction because they do not float as some sizes of coke breeze often do. Limed coke breeze is not desirable because the particles become cemented together in the presence of moisture, and can cause gas blocking in the well. No cases of gas blocking have been experienced with natural graphite that will pass through a 1-in. mesh and be retained on a 1/6-in, mesh. Such material has an apparent density of about 80 lbs per cu ft when used as backfill.

In unconsolidated formations that can be held open with drilling mud, economical deep-well ground beds can be constructed by installing anode cannisters. The cannisters can consist of galvanized corrugated cul-

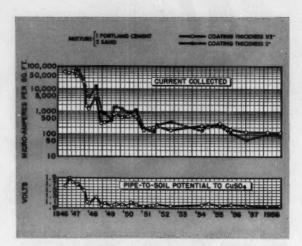


Fig. 8 - Current and potential relationships of buried steel specimens encased in 1-2 portland cement-sand mix.

vert pipe sections having expanded-metal bottoms and hardware-cloth top covers. They usually are filled with graphite, silicon iron, or some other suitable anode material in coke backfill, and are coupled together with standard band couplers.

Shielding from cathodic protection current originating at remote sources becomes a greater problem as a generating station is extended. The use of large reinforced-concrete mats, slabs, and spread footings accentuates shielding from remote ground beds. Protection in such areas can be accomplished with distributed or well-type ground beds installed close to these areas. Another approach is the use of concrete coatings in these areas. The value of concrete as a protective material is illustrated in Figs. 1, 2, 4, and 9.

#### Concrete As a Protective Material

The long-time current and voltage relationships of steel cast in concrete are illustrated in Fig. 1. These data show long-time effects, and are not indicative

|           | MILLIAMPERES / SQ. FT.                          |   |  |  |  |  |  |
|-----------|---|---|--|--|--|--|--|
| CHEMICALS | P/S 0.27 VOLTS<br>(CUSO4)<br>CURRENT DISCHARGED | P/S = -0.85 VOLTS<br>(CUSO4)<br>CURRENT COLLECTED |  |  |  |  |  |
| No Cl ion | 0.16  | 0.32  |  |  |  |  |  |
| 1% NaCI   | 15.00   | 0.19  |  |  |  |  |  |
| 2% GoGIz  | 48.00   | 0.80  |  |  |  |  |  |
| 6% CaCle  | \$50.00   | 2.20  |  |  |  |  |  |

Fig. 6 - Comparison of current discharged by specimens cast in 1-2 portland cement (test cement 1-in. thick).

|          | MILLIAMPER                               | ERES / SQ. FT.                         |  |  |  |  |
|----------|--|--|--|--|--|--|
| METAL    | P/S = -1.1 VOLTS<br>(GUSO <sub>4</sub> ) | P/S=-1.5 VOLTS<br>(CuSO <sub>4</sub> ) |  |  |  |  |
| ALUMINUM | 0+                                       | 5                                      |  |  |  |  |
| ZINC     | 0.14                                     | 17                                     |  |  |  |  |
| IRON     | 0.46                                     | 38                                     |  |  |  |  |
| LEAD     | 1.6                                      | 120                                    |  |  |  |  |
| COPPER   | 2.6                                      | 120                                    |  |  |  |  |

Fig. 7 — Three-year average current collected by specimens cast in 1-2 portland cement-sand mixture (1-in. thick).

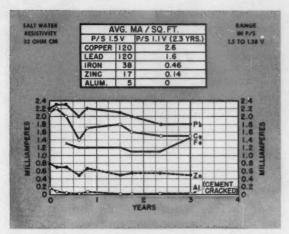


Fig. 9 - Current collected by specimens cast in concrete and connected to Mg anode (test concluded after 3 years).

CURRENT COLLECTED
BELIAMPERS / SQ. PT.

10

20

10

20

POLARIZATION VOLTAGE

10

10

10

20

POLARIZATION VOLTAGE

AP/S VOLTS (CU SQ.)

CURRENT DISCHARGED
MILITAMPERS / SQ. PT.

Fig. 10 - Current and voltage relationships of zinc cast in plaster of Paris (only polarization voltage is shown).

of measurements that would be obtained by connecting concrete-encased steel to a galvanic cell and immediately measuring the galvanic current flow and open-circuit potentials. Concrete-encased steel will polarize to the open-circuit potential of any galvanic cell in the range from about -1.1 volts to about +0.5volt measured to a copper sulfate reference half-cell. The polarization potential cannot be increased or decreased much beyond these values, although the potential measured at the concrete surface can be substantially increased or decreased beyond these values. The latter potential includes IR drops. Because the current collected or discharged changes markedly at the limiting values of polarization potential, the potential measured at the concrete surface consequently can be greater or less than the polarization potential limits.

Similar data are shown in Fig. 2 for concrete-encased steel, except that the electrolyte is 25 ohm cm instead of 85 ohm cm as in Fig. 1. The curve is relatively unaffected by the change in electrolyte resistivity. Also shown in Fig. 2 is the change that occurs when calcium chloride is added to the concrete. The addition of calcium chloride changes the limiting value of the anodic polarization potential from about  $\pm 0.5$  volt to  $\pm 0.6$  volt measured to a copper sulfate reference electrode. Without calcium chloride the concrete-encased steel is almost completely protected against corrosion from galvanic cells. Adding calcium chloride to the concrete nullifies this beneficial effect.

This is further illustrated in Fig. 3. A curve is shown for the current and voltage relationships of bare steel (without concrete coating) in a salt water electrolyte. This curve is very similar to the curve obtained in Fig. 2 with calcium chloride added to the concrete. It is no secret that salt water is a corrosive

environment for steel, but the corrosive effect of calcium chloride as a concrete additive is not so well known. Some authorities on concrete caution against the addition of calcium chloride to concrete for antifreeze or other purposes, since it can cause serious corrosion. However, opinions expressed in several technical publications indicate that an addition up to 2 percent is not harmful in its effect on reinforcing steel. The data presented here clearly indicate that corrosion of reinforcing steel in concrete to which calcium chloride has been added is a serious problem.

Concrete is effective as a protective coating for other metals than steel. Fig. 4 shows the current and voltage relationships for copper cast in concrete. As with steel, the concrete provides a protective coating for the encased copper when it is coupled galvanically to any practical construction metal. Similar data are shown in Fig. 5 for zinc in concrete.

#### Calcium Chloride Admixtures

Fig. 6 indicates the effects of chloride additions on the current discharged by concrete-encased steel maintained at a potential of -0.27 volts measured to a copper-sulfate reference electrode, and specimens maintained at -0.85 volts, generally considered the protective potential for bare steel, or steel with an organic coating. Increasing the concrete admixture to 6 percent calcium chloride increased the current discharged from 0.16 ma per sq ft to 850 ma per sq ft, an increase of 5300 times. Although the addition of calcium chloride was not so dramatic in its effect on the current collected by the protected specimen, it caused a 690 percent increase for a 6 percent addition.

The protected network at a generating station generally consists of various metals selected for reasons other than their resistance to corrosion. These metals

should be thoroughly interconnected and bonded to the station grounding system to insure electrical safety. If cathodic protection were applied to the station network, the current density on the various metals would depend upon their individual potentials with respect to their environment and upon their resistance to earth. The effects of polarization would alter the current densities in accordance with the changed cell driving voltages.

Fig. 7 has been prepared to show currents collected by specimens cast in a 1-2 portland cement-sand mixture, 1-in. thick, and maintained at potentials of -1.1 volts and -1.5 volts measured to a copper sulfate reference electrode. The desirability of maintaining the potential at the lower value is indicated by the increase in current density at a potential of -1.5 volts. Each of the mtals chosen for this experiment is fully protected from corrosion at the less-negative potential. No gain is indicated, and current has been wasted, by maintaining the over-all potentials at these unnecessarily high negative values.

#### **Concrete Coating Test Results**

The results of a 12-year test on buried concrete-encased steel specimens are illustrated in Fig. 8. When the test was begun, the samples were made negative by connecting them to the negative terminal of a rectifier, with its positive terminal connected to a ground bed. The method of sample energization was changed in 1948, and zinc anodes were used to provide the cathodic protection current. The potential has been maintained at -1.0 volt to a copper sulfate reference electrode for a period of 10 years. The current collected by the samples has gradually declined to approximately 100 microamps per sq ft. The differences in concrete coating thickness, from ½ to 2 inches, had no significant effect on the current collected during the test period.

A three-year test showing the currents collected by concrete-encased metals connected to a magnesium anode are presented in Fig. 9. A salt-water electrolyte having a resistivity of 33 ohm cm was employed in this investigation. It may be observed that the current collected during this period did not substantially change, as it did when the specimens were connected to zinc, and the potentials were maintained at less negative values. Comparative data for samples connected to zinc also are shown.

The excellence of concrete as a coating for protecting steel from corrosion is indicated by experience on the gas distribution system in New Orleans. The practice of encasing utilization pressure services in a precast concentric jacket of a 1-3 mixture of portland cement and coarse sand has been in use for over 50 years. In a system containing approximately 100,000 concrete coated gas services, less than a dozen per year failed because of corrosion. The few failures

occurred where the concrete coating had been knocked off and not replaced. No cases of corrosion damage are known to have occurred under sound, undamaged concrete.

The foregoing data and experience direct attention to the value of concrete encasement of buried metallic structures in areas which are highly shielded from distant cathodic protection current sources. The concrete coating eliminates the need for supplemental sources of cathodic protection, unless there are breaks in the concrete. Hairline cracks are of no practical significance, because the alkalinity provided by the concrete would provide protection at such locations. High-quality concrete with a minimum thickness of 2 inches is fairly rugged, and with moderate care and inspection during construction, corrosion control in shielded areas is assured.

The value of gypsum as a backfill material for zinc employed as a galvanic anode is illustrated by data presented in Fig. 10. This chart was prepared to show current and voltage relationships of zinc cast in plaster of Paris in a form similar to the data presented on metals cast in concrete. It is observed that this curve is very different from Fig. 5, which showed current and voltage relationships of zinc cast in concrete. Fig. 10 indicates that the voltage of zinc in a gypsum environment does not polarize in the anodic direction below about 0.95 volts measured to a copper sulfate reference electrode. Zinc will polarize slightly in the cathodic direction. The fact that the polarization voltage in the anodic direction remains where it does is the primary reason for gypsum's value as a backfill for zinc used as a galvanic anode.

Plant equipment such as water storage tanks, intake screens, condenser water boxes, and spillway gates require separate cathodic protection mitigation tions for corrosion control because they usually are isolated from systems installed for corrosion mitigation on the underground structures. The corrosiveness of the environment, the materials of construction, coatings, and related considerations must be evaluated in determining the most economic method of protection against corrosion in such equipment. Cathodic protection without coatings is more economical in some cases than the alternative of maintaining paint coatings. Coatings without cathodic protection, and the recently developed zinc-rich paints, also should be evaluated in any analysis.

Acknowledgement: Many of these data were developed by H. W. Wahlquist prior to his untimely passing. The work he started is being continued by his associates at Ebasco, and additional data on metals with concrete as a corrosion protective coating are being collected.

Reference: Trouard, S. E., "Cathodic Protection of the Coated Steel Gas Main Distribution System in New Orleans," Corrosion, 13, No. 3, 165t (1957).

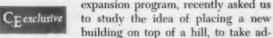


Authors John Faas (1) and Walter Hough (7) examine topographical model of Sperry Rand research facilities.

### Show the Client a Miniature

JOHN FAAS & WALTER HOUGH Walter Kidde Constructors, Inc.

A CORPORATE CLIENT, developing a large-scale expansion program, recently asked us



vantage of the commanding view. We investigated the location, and, after careful analysis, reported that the hilltop site was more pretty than practical. Nevertheless, management still wanted the hilltop site. So we built a scale topographical model, showing the relationship between the proposed building and the contours of the land. This simple device made our arguments clear, and, in influencing the decision to use a more suitable site, benefited both us and the client.

For some time we have been building models of this type with favorable results. In our opinion, one topographical model is worth a dozen sketches and several thousand words of explanation.

#### "Show Me"

Of course, not all clients come to us with preconceived notions about the proper spot for their new plant, research laboratory, or headquarters building. More often management approaches the task with an open mind and welcomes an opportunity to be shown. In these instances, a model enables executives to see for themselves the advantages and disadvantages of alternative ideas. But either way, the models are worth the small amount of effort put into making them.

Our models are constructed of cardboard, or a soft wood like balsa. They consist of the base, which indicates the contours of the property; and scale reproductions of the buildings. By gluing together strips of cardboard, the base is built up to show contours with elevation variations anywhere from 2½ to 10 feet, depending upon the size and scale of the model and the steepness of the slope. An accurate topographical survey of the site is essential. We like to work from maps supplied by the Coast and Geodetic Survey, although aerial photographs often prove useful as well.

The exact scale varies. Usually, the largest is 20 feet to the inch; the smallest, 40 feet to the inch. Anything smaller than that simply does not show enough.

To be fully effective, the model should indicate as many topographical and other features of the land as possible. The location of existing woodlands, streams, rock formations, and permanent structures all influence the way the new building will be integrated with the site. Often, showing these features will reveal how precious site resources can be utilized and conserved. In one instance, a model helped us save a considerable number of trees, and substantially reduced site preparation costs for the owner.

It is doubtful whether a model will reveal anything to an engineer or architect that will not eventually become apparent on drawings and sketches. But models can expedite work by permitting designers to see — right away — possibilities that otherwise might not have become evident for some time.

#### **Designing For Expansion**

A model proved effective when we designed a basic research laboratory for Sperry-Rand at Sudbury, Massachusetts. The structure had to be positioned so that it could be expanded in any one of a number of different directions — depending upon which branch of research developed most rapidly. The variables involved were staggering, so we built numerous block models of different structures, and experimented with them on a topographical reproduction of the site until we developed an arrangement that satisfied both client and designer.

At first we believed that a flat spot near the top of a hill might prove best, but we rejected it in favor of two sites further down the hill. One of these had a southern, and the other a western, exposure. Of these, the southern exposure seemed best.

The models helped us establish that the site with the southern exposure best combined practical and aesthetic considerations. It provided a sufficiently large area of gently sloping land that lent itself to expansion in a number of different directions. It placed the building on an east-west axis, simplifying air conditioning and heating problems. And it located the front of the building so that it overlooked the picturesque countryside. Our building design for this location was a flexible two-story front, one-story rear facility. While the lower story had half the area of the upper one, the arrangement of space was similar. Each floor had interior laboratories and exterior offices separated by a hall.

We might have come up with the same concept even if we had not made a model. But what was most important was that management could follow our elimination process visually as we knocked models apart, put them together again, and moved them about.

#### **Meeting Special Requirements**

Models also helped us overcome two different problems when we designed a new office building for World Book Company, at Tarrytown, New York. Here we had to incorporate with the new structure an existing mansion which the company planned to use as a cafeteria and lounge. In addition, a three-story building, which offered many of the advantages we sought, was prohibited by local ordinances. By experimenting with models, we were able to show the owners how the new facility could be so situated that the second floor of one wing merged with the first floor of another wing. In this way, the owner obtained many of the advantages of a three-story structure without violating zoning regulations. Furthermore, the models showed how the new building would combine with the old mansion for maximum use of both.

Frequently, technical factors play a part in the way a building must be placed on a site. For example, a research laboratory we designed for General Electric, in Ithaca, New York, included a penthouse for radar equipment. The penthouse had to be positioned to provide 90 degrees of uninterrupted visibility for accurate radar calibration. Using models, we were able to determine the best relationships among the penthouse, the rest of the facility, and the total site.

#### **Continued Use of Models**

Generally, once we show the position of the facility on a site, we drop the models and work out the remaining problems on the drawing board. But occasionally, at a client's request, we will construct more elaborate models. These may be concerned with overall architectural treatment — solar heat control, land-scaping, colors, and fenestration. On some projects, we have proceeded from study models to architectural models to a full-scale mockup.

Once the models serve their architectural function, they need not be put on the closet shelf. Many corporations find that they are valuable for display purposes, and even come in handy for recruiting new employees before the building is completed. Personnel officers have found them useful in luring research scientists, who are hard to hire and even harder to hold. Researchers are sticklers for working environment, and an architectural model gives them an idea of the kind of working conditions they will have.

As time passes, we believe engineers and architects will rely increasingly on models to present their concepts to laymen. This will be partly the result of the rapid disappearance of level building sites, especially in the suburban areas to which numerous corporations are attracted. Models are particularly helpful in areas where the building must blend with the environment.

But the more important factor is the increasing emphasis that management is placing upon the creation of a favorable working environment. Our observation is that companies are becoming more fussy about their facilities — not only the way they function but where they are built and how they appear. In this respect, models help management comprehend the environment the engineer or architect is trying to create.



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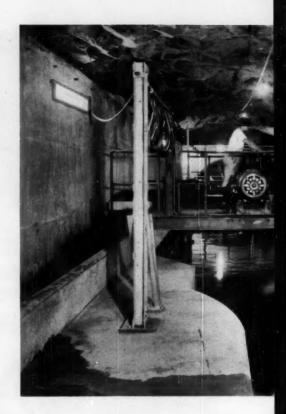
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## Why Not Keep It Underground?

EDMUND B. BESSELIEVRE Consulting Engineer



THE GROWING NEED of today's cities for more

CEexclusive

parking space and playground area might be partially met by placing new sewage treatment plants underground

and roofing them over. There are many precedents to prove that this practice can be both economically feasible and desirable.

The Romans in their "cloacae maximae" and the French in the storied sewers of Paris kept their sewage underground. Now we moderns, after following the same practice to a given point, go to the expense of pumping sewage to the surface — and higher — for treatment, and then run the effluent through subsurface pipelines back to the water course. In fact, the laws of all states require that we keep the sewers below ground, but no law compels us to re-elevate it for treatment. What began as mere custom, through long practice has become a tenet of modern sanitary engineering theory.

#### **Unnecessary Pumping**

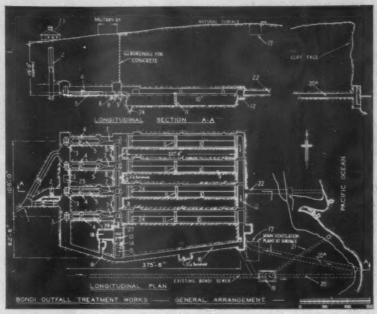
Pumping costs money, and at any sewerage system that terminates at a conventional treatment facility, the sewage must be lifted a substantial distance. In flat areas this frequently entails pumping the sewage against a head of 50 feet or more. In large plants, which handle millions of gallons of sewage daily,

pumping probably produces the largest single item of annual maintenance expense. To prevent interference in the handling of the sewage caused by breakdown, power failure, or other reasons, it is necessary to provide a battery of pumps, of which several are standby units. There also must be another auxiliary pumping unit operated by an independent source of power to continue service in the event of failure of the normal commercial power supply.

As long as we have the sewage below ground when it reaches the disposal site, why not keep it there and put the sewage treatment units below ground also? In many instances the sewage would gravitate to the treatment facilities, and flow directly to the units—it would not be held up in a pumping station wet well where odors may be produced. The treated effluent might, of course, have to be pumped to the ultimate water course. However, treated effluent that is clarified and freed of pump-destroying solids and grit usually requires a less expensive type of pump. Even if an effluent wet well were considered essential, the treated effluent would have lost its ability to cause a nuisance from odors, despite prolonged detention.

The question will be raised, "Isn't underground construction expensive?" Any form of sewage treatment works is expensive, but in most instances, when all offsetting benefits are evaluated, the actual cost of an





The Bondi sewage treatment plant near Sydney, Australia, was built in underground rock tunnels. The treatment lines are located in each of the four, 30-ft tunnels, and can handle a maximum storm flow of 250 cfs. Work on the plant, begun in 1936, was held up by World War II, but has recently been resumed. Total cost of completed project has been estimated at nearby \$4 million.

underground plant will not exceed appreciably the over-all cost of a properly designed, architecturally attractive, above-ground plant.

#### **Camouflage Problems**

It is an old saying in the sanitary engineering profession that "people smell with their eyes." Many who know nothing of the modern art of sewage treatment suddenly discover odors around sewage works when informed that an otherwise unidentified building is a sewage treatment plant.

That an underground sewage plant can quell public opposition to construction of centrally located treatment facilities is best illustrated by citing the example of the sewage treatment plant at the New Jersey resort town of Spring Lake. The logical site for a treatment plant in this oceanside town was a low point near the shore, towards which all sewers drained naturally. Unfortunately, the proposed site was a highly regarded landscaped area, fronting on both the hotel-studded ocean drive and the fashionable boardwalk. Something as widely classified a nuisance as a sewage plant was not allowed, since it would spoil the view from the plush hotels, and be deemed obnoxious by the thousands who used the beaches.

It took considerable persuasion to get the town council to consider a sewage plant on this site. However, a few visits to modern treatment plants convinced the council of the practicality of the scheme. Engineers subsequently were selected, and the plant was completed and placed in operation in 1931. The plant still is functioning satisfactorily, and neither hotel patronage or real estate values have been adversely affected. In fact, few people are aware of the plant's presence.

This modern mechanized plant is made up of screening, grit removal, sedimentation, and sludge digestion equipment, from which sludge digestion gas is procured for heating the plant. The digestion tank is enclosed in a concrete chamber which lies entirely below ground level. In fact, most of the plant is below sea level, and is covered with a concrete roof capable of sustaining a 10-ton load. At the center of the plant, there is a hollow steel flagpole, which actually is the vent stack from an exhaust fan. This fan draws in clean air from four small covered vents, one at each corner of the plant roof, and exhausts all dampness and chamber air to the top of the pole. The cover-up is completed with a fine stone bench circling the pole at the ground level.

The entire plant area is sodded and maintained as a well kept lawn, which is in complete keeping with the grassed area extending along the entire oceanfront edge of the town. The only evidence of any construction is a small entrance house, which does not indicate its purpose and is never open to the public. Screenings and grit are removed only at late night hours. Sludge is digested, but retained in the digestion tank until the season closes. It then is discharged through the outfall sewer to the sea.

#### Design Economies

Designed for a 1.2 mgd capacity, the \$200,000 plant and collector system proved economical when compared to the original scheme of locating the plant inland from the sea. The first plan would have required over three more miles of pipelines, running from the collector lines to the plant, and a longer effluent line to the sea, plus extra pumps and equipment. This plant is an outstanding example of the economies gained by locating such a utility at a logical site and making use of modern techniques of completely mechanized sewage treatment. Now, after 30 years of service, it is still operating to the satisfaction of the town and the state health authorities.

The sewage reaches the plant and flows through treatment units by gravity. Since the normal level of the sewage in the sedimentation units is two feet below mean low water in the ocean, only low lift pumps are required. Had a conventional above-ground type of sewage treatment plant been built a mile or so back of the town, it would have been necessary to lift the sewage more than 25 feet. It then would have required another set of pumps, and another line back to the sea to get the effluent into the 1500-ft submerged outfall which carries it beyond the breaker line. Another interesting economy of this plant is that, since it is located immediately adjacent to the casino and bathing establishment where a large laundry is required, the sludge digestion gas can be used as the fuel for the washers and dryers.

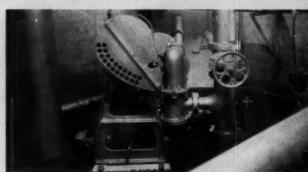
With the plant underground, the area required for sewage treatment can remain aesthetically pleasing and useful for recreational purposes. The typical above-ground sewage treatment plant site has no function other than the treatment of the sewage. Thus, it would be a real advantage if, every time a new sewage treatment plant were built, it would add additional area for recreation or other use.

#### **Public Acceptance**

In many instances, when a sewage facility bond issue is placed on the ballot, it is defeated because all that the voters can visualize is an expense for handling a substance about which they prefer to remain ignorant. On the other hand, who knows what would happen if the bond issue were to be based on the premise that the funds were needed for a new recreation area, and, incidentally a sewage treatment plant. The bond issue might have a greater chance of passing.

The experience of the City of Rochester, New York, may back this up. Over the years it had become neces-





A small entrance house is the only above-ground part of a New Jersey plant. The vent stack is a hollow flag pole.

sary to construct several large sewage treatment plants in various sections of the city. Each time sufficient land was purchased to provide a new public park, and getting bond approval was never difficult. People have been observed eating their lunch in close proximity to the units, apparently unaware of their purpose.

#### Military and Topographic Advantages

Underground construction offers camouflage protection. High flying airplanes can spot a sewage or water plant by the regular shape of the tanks. The enemy aviator knows that a bomb dropped on the tank may seriously interfere with the normal life and comfort of the city served by the plant. During the last war extensive studies and conferences were conducted to determine how the buildings of such plants could be camouflaged effectively. It was observed that a crew of a plane flying at 15,000 to 20,000 feet could not distinguish the buildings, but the liquid filled tanks stood out glaringly. Destruction of the tanks would effectively destroy the buildings, however well they might be camouflaged.

The underground plant usually will be placed in the most logical site, regardless of the character of the surroundings. Obviously, a conventional, aboveground, open type plant would not be acceptable if placed in the public square of a community. However, if topographical data indicates that a central community site is the logical point to which to drain the sewage, a mechanized underground sewage treatment plant placed there will not destroy the usefulness of the square or interfere with its former use. Such a plant was constructed in a centrally located park in Delray, Florida, in the mid-twenties.

#### **Effect on Property Values**

A modern mechanized plant's operation is quiet and odor-free. Since sewage is retained only during normal passage through the units and sludge is kept in closed pipes and digestion units, there is no fear of nuisance from odors. Proper ventilation can easily remove all dampness and odors. Perhaps this explains why the underground plant does not upset property values in its vicinity. With no unsightly tanks and structures in evidence and no noise or odors, there is nothing objectionable to consider.

#### **Architectural Economics**

The underground treatment plant, being hidden from view, requires little or no architectural treatment to make it acceptable to the general public. Costly ceramic tile facings and mural paintings such as used on the Coral Gables, Florida, treatment plant — and others — would not be needed had these plants been located below grade. A high percentage of the actual cost of the plant enclosure is embodied in the abovegrade architecture which is viewed by the public.

However, engineering and architecture can be effectively combined where the below-grade treatment plant is combined with above-grade parking structures. Every city, but particularly the larger ones, are plagued with the problem of parking for autos driven into urban areas by workers and visitors. New York City, which has many large sewage treatment plants in business and residential districts, could have developed acres of parking space if the plants had been built underground or even roofed over. The revenue from parking fees would have contributed much to the amortization of roofing the existing plants. Of course, Chicago, Los Angeles, San Francisco, and many other cities which have sewage treatment plants in congested areas could attain the same benefits.

#### Sewage Treatment Down Under

In Sydney, Australia, the favorite ocean bathing place is Bondi Beach. As early as 1889 a sewerage system was built to serve the northern areas of this city. The sewage was discharged into the Pacific Ocean north of Bondi Beach, and, since this area was sparsely settled, the immense dilution provided by the ocean was considered adequate. However, this area now has a population of over 300,000 persons, and the discharge

of untreated sewage near the beach area has promoted a serious pollution and health problem.

In the Bondi sewer system, the junction point of the various collectors at the outfall sewer is from 115 to 150 feet below the natural surface, and large pumping stations are needed to elevate the sewage. Storm flow amounts to a maximum of 250 cfs, or over 148.6 mgd, and the average flow is 56 cfs or 36.2 mgd.

Since the portions of the Bondi sewer near the outfall had been constructed in a rock tunnel, any proposed treatment plant would have had to be constructed in excavations in the rock. The ultimate design, approved prior to 1936, provided for four tunnels, each 30-ft wide, separated by rock buttresses of not less than 24-ft thickness. Each tunnel treatment unit was designed to handle one-quarter of the total maximum flow.

Located at the entrance end of each tunnel treatment line is a drum screen to remove large objects and garbage type solids. These screenings are fed to disintegrators before they are returned to the main flow in the sedimentation sections. Each of the four sedimentation channels is 24-ft wide by 235-ft long, and the minimum water depth is 18.75 feet. This provides a detention period of eight hours with minimum dry weather flow; 30 minutes with maximum storm flow.

The flow is divided equally among the four channels by manually-operated vertical slot control gates at the entrance. Sludge and scum in the sedimentation units are collected by Dorr Monorake automatically controlled mechanisms, which travel up and down the tanks, collecting sludge on one pass, scum on the other. The sludge and scum accmumlation is pumped about 10 miles to the sludge digestion units of a conventional above-ground plant.

The work on the plant was begun in 1936, but the war curtailed construction. According to recent reports, the first stage of the plant now has been completed and put into operation.

The estimated cost of the Bondi plant is £1.3 million (Australian) or \$3.7 million. On the basis of the designed average flow (dry weather) of 36.2 mgd, the cost per million gallons capacity averages out to only slightly over \$100,000. In view of the site conditions and construction problems encountered, this is well in line with the cost of surface plants.

It is difficult to understand why more attention has not been given to the construction of other underground sewage treatment plants. Perhaps at first glance cost would appear to be prohibitive, but sufficient evaluation of all the economic factors and advantages of this type of facility has not been undertaken. Equating the crowded conditions in many cities with the high cost of land areas for sewage treatment purposes, it is felt that the multiuse advantages of underground construction should be given mature consideration.

QCC 200 amp breakers 1/2 cost 1/2 size 1/2 weight of conventional breakers





From Westinghouse comes a complete new line of circuit breakers designated type QCC which are just ½ the cost, size and weight of conventional 200-amp breakers. They are designed for service entrance use up to 240 volts a.c. and 10,000 amps maximum interrupting capacity rating.

Although economically priced, Westinghouse QCC Breakers include the quality features of De-Ion arc quenchers, a quick-make, quickbreak over center toggle mechanism, and thermal magnetic trips.

For more information contact your Westinghouse representative, Westinghouse distributor, nearest independent panelboard-switchboard builder, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa. You can be sure . . . if it's Westinghouse.









1 POLE 120/240v. 2 POLE 120/240v. 2 POLE

3 POLE

Westinghouse W



The combination of NAYLOR Spiralweld pipe and Wedgelock couplings can save you time, work and money on piping for air, water, dredging or ventilating service on construction jobs.

Here's why. This distinctive line has the strength and safety required for rugged jobs. And you can put it together with a hammer. The pipe is light in weight, so it's easy to transport and handle. Connections are simple and fast, too, with the Wedgelock coupling. It is designed to join grooved-end pipe quickly—even with only one side of the pipe in the open. No special tools are required—a hammer is all you need to connect or disconnect the line.



NAYLOR Wedgelock couplings make a positive connection securely anchored in standard weight grooved ends.

For details on this dependable NAYLOR piping combination, write for a copy of Bulletin No. 59.



NAYLOR PIPE Company

1276 East 92nd Street, Chicago 19, Illinois
Eastern U. S. and Foreign Sales Office: 60 East 42nd Street, New York 17, N. Y.

#### How to Select

### A Consulting Engineer

#### The Coordinating Committee's Guide

THE COORDINATING COMMITTEE, which recently released a policy statement on the consulting engineers' views of government engineering, now has adopted a "Guide for the Selection of Engineers in Private Practice."

Although not particularly original (much of it is based on an official Air Force policy), the Coordinating Committee's new Guide is designed to stress the unified views of its members - the American Institute of Consulting Engineers; the Consulting Engineers Council; the American Road Builders Association, Engineering Division; the American Society of Civil Engineers; and the National Society of Professional Engineers. The Guide is expected to be particularly useful to government agencies or units on the state, county, and municipal levels.

The Guide states:

"The general public - and frequently members of local, state, and Federal governments - apparently misunderstand the meaning of the term 'consulting engineer,' the method of selection and negotiations, and engineering charges that are applied to the engagement of engineers. Newspapers and other branches of the press reflect this misunderstanding by implying that the consulting engineer is an individual who advises or consults; that he has been selected on the basis of friendship, politics, or a combination of both; and that his remuneration - perhaps because

traditionally it has been called 'fee' - is 100% profit."

#### What a Consulting Engineer Is

"Contrary to this belief, consulting engineering today is performed by firms with large payrolls, some employing up to 1000 engineers, designers, draftsmen, computers, surveyors, and other technicians. Consulting engineers should be thought of as engineers in private practice, who are offering highly technical and professional services for studies, reports, surveys, planning, testing, design, and inspection of construction. It is important that these misunderstandings be corrected.

"Poor selections — resulting from poor judgment, lack of experience, carelessness, or failure to know the needs of the project and the engineer's background — have led to criticism in certain areas, which is bad public relations for government and private engineering firms, and in the end, is a real disservice to the public.

"No two engineering firms have equal training, experience, skills, capabilities, personnel, work loads, and particular abilities. The choice of the correct and fully qualified firm for a specific project can mean the difference between a well planned, low cost, successful project and a mediocre and costly one — frequently with unpleasant consequences for client and engineer.

"Within the government agency or industry, an administrative policy must be established which des-

ignates the persons, or person, and empowers them to select or recommend engineering firms for various employments . . . Probably the most satisfactory organization would consist of a board of three men, at least one of whom should be an engineer, appointed to investigate and make recommendations, holding such interviews and inquiries as they feel may be desirable. If the selections are to be made infrequently, the board should be appointed for a specific project; otherwise, the board may be designated on a permanent basis, with personnel adding membership on the board to their regular duties. The final approval for selection should be by the chief officer, based upon recommendations by the board."

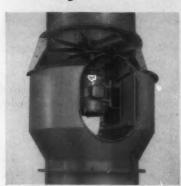
#### How Firms Qualify

"An administrative policy within the agency should be established in line with that agency's determination as to what will be in its best interest and that of the public. For example, among other things, it is common practice, where qualifications are equal - and the board must be sure they are equal for priority to be given, first, to a local firm; failing approval of that firm, then to a firm within the state; and if that firm does not meet the standards, then to any qualified firm within the United States. Other basic requirements:

"1. The firm shall be of high ethical and professional standing,



# SLIDE-OUT MOTOR AND FAN' cut your maintenance costs



Simply removing patented half-section of cone (left) allows motor-and-fan assembly to slide on rails (above) right out of DeBothezat Bifurcator for quick and easy inspection and maintenance. Bifurcator housing, originally installed as a section of the duct work, remains in place. This ease and convenience result in quick work which sharply cuts your maintenance costs.

#### DIRECT DRIVE CUTS COSTS, TOO

Direct drive eliminates inefficiency and maintenance problems of belts, yet motor operates in cool, clean air. Twin ducts of Bifurcator carry abnormally hot, corrosive or explosive fumes around motor, isolate it from destructive fumes handled by direct-drive exhaust fan. Fan wheels available from 12" to 48".

\*Optional extra. Patents Pending.

Write for illustrated Bulletin DB-7-61

## De Bothezat®

DE BOTHEZAT FANS DIVISION OF

American Machine and Metals, Inc.

Dept. COE-1161, EAST MOLINE, ILLINOIS

Divisions of American Machine and Metals, Inc.

TROY LAUNDRY MACHINERY & RIENLE TESTING MACHINES & DE SOTHEZAT FANS & TOLHURST CENTRIFUGALS & FILTRATION ENGINEERS & FILTRATION FABRICS & NIAGARA FILTERS & UNITED STATES GAUGE & AUTOBAR & AUTOMATIC DEVICES & LAMB ELECTRIC COMPANY & HUNTER SPRING COMPANY & GLASER-STEERS CORPORATION with its members being of good moral character, and it should be prepared to submit references of known repute.

"2. The principal and responsible members of the firm must be registered professional engineers in their state of residence, and also qualified to obtain registration in any state in which the firm's services are required.

"3. A principal member of the firm's staff must have at least ten years recent experience in responsible charge of engineering work of the type involved in the project. For the purpose of this section, 'responsible charge' should be construed as defined in applications for membership in ASCE.

"4. At least two additional members of the firm's staff must have at least five years' experience in responsible charge in the field, or fields, required by the project.

"Every firm interested in an engagement should disclose complete information on its qualifications; then, if requested, submit up-to-date data, year-by-year.

"Many of the U. S. government agencies now use DD Form 1071; this will be superseded by Standard Form 251 (June, 1961). This form develops the basic information regarding the engineering firm, its personnel, the general type of work done, the personal history of principals and key men, the current work load of the firm, and a record of projects previously designed. It is hoped that this form will be adopted as a nationwide standard so that the preparation of one form by an engineering firm would serve all agencies. It is believed that there is no need for variation in the required information by the different agencies. In addition to the specific data requested, some engineering firms may wish to submit their own brochures, with photographs and general background data.

"These data, uniformly prepared, are easily maintained and kept current, and should serve as an efYOUR FISHER/MAN STANDS BEHIND THIS PNEUMATICALLY OPERATED PISTON ...

# FOR Inherent AccuracyPower-Speed and Stability FISHER TYPE 470 P.O.P.

- Delivers same power in either direction at any point of the stroke.
- Adaptable to virtually all types of valve bodies including Butterfly valves.
- No air set required—utilizes clean, noncorrosive air or gas up to 150 psi.
- Easily reversible actuator can be changed in the field.

This small, compact piston actuator incorporates its own positioner mounted integrally on top of the cylinder. Positioner receives any of the normally used pneumatic instrument signals. Then, without an air set, actuator utilizes the full potential of the available instrument or gas supply to provide exceptional speed and power. Series 470 in available in six basic sizes and can be supplied for travel up to 4". Basic actuator can also be furnished with a handjack, hydraulic snubber, pneumatic safety devices or as a spring return unit. Write for Bulletin E-470.

#### PERFORMANCE DATA

| Air Consumption | (Static) | 20 SCFH | at 100 | psi supply. |
|-----------------|----------|---------|--------|-------------|
|-----------------|----------|---------|--------|-------------|

| Instrument | Signals | 3 | to   | 15   | psi, | 5 to | 25   | psi,  | 5 to | 30   | psi, |
|------------|---------|---|------|------|------|------|------|-------|------|------|------|
|            |         | 1 | 2 to | 0 60 | psi. | Sui  | tabl | e for | spli | t ra | nge  |

Temperature Limitation.....175°F.

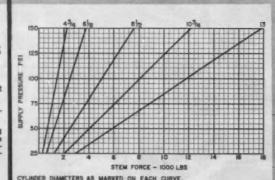
Maximum Hysteresis..........15% of total stroke or instrument signal.

Resolution Sensitivity...... Minimum change in the measured variable to produce an effective movement of the final control element is .02% of the instrument pressure range.

Frequency Response......1.4 cps for the Size 60.

Load Sensitivity....... Percent of total travel per 100 lbs. stem force is .065% for Size 60.





AVAILABLE STEAM FORCE



F IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY ...

#### FISHER GOVERNOR COMPANY

Marshalltown, lowa / Woodstock, Ontario / London, England
BUTTERFLY VALVE DIVISION: CONTINENTAL EQUIPMENT COMPANY, CORAOPOLIS, PA.





General Service Unipumps among specified products for both new construction and old building replacement.

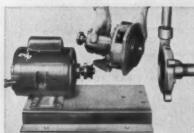
Engineers recognize the Weinman Unipump as the versatile workhorse" of the industry. Available in output ratings up to 260 g.p.m. against up to 200 foot head, the Unipump is ideal for pressure boosting, moving hot or chilled water and many other general purpose pumping needs. Compact but rugged, it fits into a small area wat delivers the same 24 hour maintenance free service service vou expect. yet delivers the same 24-hour, maintenance-free service you expect and get from every Weinman Pump.

Other standards of the air conditioning industry are Weinman Types ACB and AEB Single Stage, End Suction Pumps with output ratings to 240 g.p.m., up to 200 foot head. Designed for efficient, dependable circulation of hot and chilled water and pressure boosting, these pumps give years of maintenance-free service in addition to initial economy.

> Routine servicing is fast and easy. Pumping unit can be disassembled without breaking pipe connections or disturbing motor. Bearing bracket is removed from casing by taking out a few bolts. Seals are replaced without disconnecting casing from pipe line.

Whatever your pumping needs...you'll get the best solu-tion with a job-fitted Weinman Pump . . . consult your Weinman Pump Specialist. He's listed in

the Yellow Pages.





fective reference for firms when, for any reason, the use of a private engineering firm is needed to supplement the staff of the agency."

#### Selecting a Firm

"The selecting organization should study the proposed project and its engineering needs so that its board knows what is required from and expected of the engineer in private practice. If the board does not know, and has no previous experience with engineering firms which heretofore rendered satisfactory services, then it should:

"1. Consider the qualifications of a number of firms which appear to be capable of meeting the require-

ments of the project.

"2. Select those three to six firms which appear to be best qualified for the particular project; write each of them individual letters, describing briefly the proposed project, and inquire as to their interest in it; then, on receipt of an affirmative answer, request them to come in for a separate personal interview, and, at the same time, give the firm's representatives an opportunity to inspect the site and terrain, explaining fully the proposed services required; at the inteview, go over the qualifications and records of each firm; have the firm submit up-to-date data on the available staff (beyond that shown on Form 251), a brief description of work on hand, and the specific personnel assignable to the project.

"3. Check carefully with all recent clients for whom the engineers have rendered services, and determine the quality of performance.

"4. List three of these firms in the order of their desirability, taking into account their location, reputation, experience, financial standing, size, personnel available, quality of references, work load that would permit prompt and efficient service, and any other factors peculiar to the project.

"5. Choose the firm considered to be the best selection for the job to be done, then hold a complete



# Solve Small Space Heating Problems with Suburban Novent-Dynavent GAS Heaters

Heat by the roomful...that's what you get when you specify Suburban Novent or Dynavent Gas heaters. No need to heat unused or unoccupied rooms. No

flue or chimney needed. Ideal for added rooms, cabins, playrooms, closed-in breezeways, offices and garage workshops.

Suburban Novent and Dynavent Gas heaters give you all the advantages of modern gas heat...high efficiency,

Right: These units are installed at the Price Apartments, Nutley, New Jersey (shown above). Each apartment is individually heated to exactly the temperature desired by the occupants. precise control, speed, cleanliness, economy and dependability of supply. Gas can be the answer to your unusual or everyday heating problems.

Heat better for less with Suburban Novent or Dynavent Gas heaters. For complete information, contact your local Gas Company, or write to Suburban Appliance Co., Dept. CE 1161 Morristown, New Jersey. American Gas Association



FOR HEATING...
GAS IS GOOD BUSINESS!

second hearing with that firm as to its abilities and capacities; at the same time, discuss the questions of compensation, as noted below."

#### Establishing the Fee

"The word 'fee' frequently implies — and is generally assumed to be — money paid to an individual for a service. In the case of engineers in private practice, it is almost always completely misinterpreted. In the latter case, the fee engineering

charge is actually reimbursement for a variety of engineering costs represented by technical payroll, administrative and clerical help, equipment, supplies, office space, taxes, and — finally — a modest and appropriate percentage of the engineering charge as remuneration to the engineering firm's partners or owners, who have a large capital investment in it.

"Compensation for engineering services may be calculated and established by a variety of methods. Many government agencies have their own preferred methods, and all engineering societies have issued manuals describing many methods. Among these can be mentioned: percentage of estimated or actual cost of construction; fixed lump sum; cost, plus a fixed amount; salary cost times a factor, plus incurred expenses; per diem; and several others.

'A reasonable range of cost for good quality engineering services can be established easily from the general experience record of the agency involved, or, if necessary, through conversations with several engineering organizations. No ethical engineer in private practice will submit a bid or quote a price which is to serve as a basis for its selection, because quality - and not price - is the only true measure of the worth of professional services. This holds for lawyers and physicians, as well as for engineers. Selection influenced by price leads to the possible employment of an inexperienced engineer, whose services may cause an unwarranted increase in construction cost.

"When the selecting agency has decided upon the first firm of its choice, the agency should call in that firm to negotiate acceptable scope and compensation; if the parties are unable to arrive at a mutually satisfactory understanding, then the agency should hold a similar negotiation meeting with the second firm on the list; failing accord with the second firm, then the agency should negotiate with the third firm on the list. Such negotiations usually will result in a mutually satisfactory contract.

"When all engineering matters, and the charges therefor, have been agreed upon, the selected firm may either (1) submit a proposal by correspondence for undertaking the project for acceptance, or (2) the administrator may draft a formal contract, embodying all conditions and charges, for signature by both parties."



# NOW! Honeywell licks the washing problem in electronic air cleaning

Exclusive Flutter-Jet washing system forces water all the way through to wash away dirt automatically... eliminates breakdowns...makes a cleaner virtually trouble-free

Efficient washing is the key to efficient air cleaning. But up until recently, nobody was able to come up with a positive, trouble-free washing system.

Now Honeywell engineers have licked this problem once and for all.

Honeywell's exclusive Flutter-Jet washing system does the job thoroughly and automatically. Gone are the problems of breakdown, poor efficiency and high maintenance that have plagued air-cleaning systems in the past.

#### Removes dirt with a blast of water

A powerful jet-stream of water shoots out of a flexible hose which whips up and down at



JETS PENETRATE WHERE SPRAY CAN'T

Mounted on moving manifold, Honeywell Flutter-Jets whip up and down. Blast jets of water all the way through dirty air cleaner plates. Ordinary nozzles tend to fog. Thoir thin spray fans out. Can't penetrate or clean as jet-streams do.

a rapid rate. This throws thousands of jets of water in, on and through the collection plates. The manifold, moving back and forth, sweeps the area completely, washing every corner.

Honeywell's Flutter-Jet washing system includes five cycles of Jet washing. A final spraying of adhesive can also be supplied when necessary to allow the dirt to be washed off more easily in the next wash.

Unlike other washing systems with spraytype nozzles, Flutter-Jet cannot fog the water or clog, which reduces cleaning power and adds to maintenance.

Already in operation for well over a year in many buildings, the trouble-free operation of Honeywell's electronic air cleaner with Flutter-Jet washing is a matter of record (available just by writing for it).

Before you design the air conditioning for your next building, check into Honeywell's air recovery system, with exclusive Flutter-Jet washing action. Installation is easy, 4 models to choose from to fit every requirement. Service is as close as your client's phone. And, if you want more details, call the nearest Honeywell office—112 throughout the country. Or write Honeywell, Dept. CCE-11-154, Minneapolis 8, Minnesota.

HONEYWELL INTERNATIONAL. Sales and service offices in all principal cities of the free world. Manufacturing in the United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

Honeywell

H First in Control

### 3 ways you can learn more about large a-c electric power apparatus applications...

No. 1: Take E-M's Power Quiz. In the quiz on these two pages, each photo shows a specific type of induction motor, synchronous motor, generator, motor control or generator switchgear for a specific application. The instructions in the middle of the opposite page tell you what to do and where to find the answers. Try it . . . it's fun.

No. 2: Get Your Data Manual. Write for your free E-M Application Data Manual described below. It's packed with valuable engineering data to help you on complex application problems.

No. 3: Call on E-M Experience. Let E-M be your specialized partner in solving your specific application problems. The Power-Quiz photos on these pages show just a few of the application problems solved by E-M during more than 60 years experience. For immediate assistance call your nearest E-M Sales Engineer or write us direct.



This fact-filled manual contains E-M's ABC Synchronizer series which comprises 200 pages of useful application engineering data on large-horsepower motors, generators, controls and switchgear. To get your copy, just write your request on your firm's letterhead and mail to Manual, Electric Machinery Mfg. Company, Minneapolis 13, Minnesota. Offer good to April 30, 1962.



Specialists in making power apparatus do exactly what you want it to

ELECTRIC MACHINERY MFG. COMPANY • MINNEAPOLIS 13, MINNESOTA Induction Motors • Synchronous Motors • Motor-Generator Sets • High-Cycle Generator Sets Water-Wheel Driven A-C Generators • Adjustable-Speed Magnetic Drives • Motor Controls Engine-Driven A-C Generators • Turbine-Driven A-C Generators • Generator Switchgear



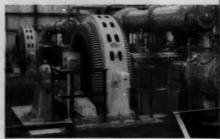
- A. Two-pole induction motors driving boiler feed pumps
  - B. Engine-type synchronous motors driving compressors
  - C. Bracket-type, wound-rotor induction motors driving coal pulverizers



- A. Engine-type synchronous generators driven by diesel engines
- B. Flange-mounted synchronous motors driving reciprocating compressors
- C. Pedestal-type synchronous motors driving blowers



- A. Single-bearing "Packaged" synchronous generator for diesel engine drive
  - B. Two-bearing "Packaged" synchronous generator for diesel engine drive
  - C. "Packaged" synchronous generator with adapter for diesel engine drive



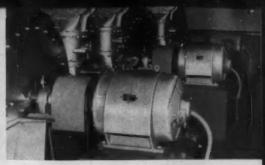
- A. Flange-mounted synchronous motors driving compressors
  - B. Engine-type, low-speed synchronous motors driving compressors
  - C. High-speed synchronous motors driving centrifugal compressors



- A. High-voltage, draw-out air circuit breaker, squirrel-cage induction motor control
  - B. Low-voltage, combination breaker type, wound-rotor induction motor control
  - C. Medium-voltage, current limiting fuse, contactor type, synchronous motor control



- A. Vertical synchronous motors driving pumps
  - B. Flange-Mounted synchronous motors driving compressors
  - C. Engine-type synchronoous motors driving grinding mills



- A. Pedestal-type, squirrel-cage induction motors driving pumps
  - B. Bracket-type, squirrel-cage induction motors driving pulverizers
  - C. Flange-mounted, squirrel-cage induction motors driving compressors



- A. Vertical magnetic drives and motors on sewage pump application
  - B. Geared magnetic drives and motors on sewage pump application
  - C. Close-coupled synchronous motors driving compressors



#### Power-Quiz

Below each photo are three descriptions. Pick the one you think best fits the photo. Be careful . . . for some photos there are two possible correct descriptions...but one fits best. Then check your choices against the answers found on the page listed below. Have fun!

Answers on page 158



- A. Two-bearing, single-shaft motor-generator set for uninter-rupted power supply
  - B. Engine-driven, brushless synchronous generator for uninterrupted power supply
  - C. Flywheel motor-generator set for uninterrupted power supply



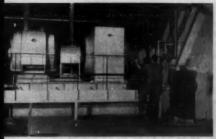
- A. Two-speed synchronous motor driving rubber mill
  - B. Squirrel-cage induction motor driving gyratory crusher
  - C. Low-speed synchronous motor driving ball mill



- A. Four-bearing, high-frequency motor-generator set for in-plant power
  - B. Two-bearing, high-frequency motor-generator set for jet aircraft checkout
  - C. Two-bearing, high-frequency motor-generator set for computer power



- A. High-voltage, draw-out air circuit breaker, motor control with incoming line panel
  - B. Low-voltage generator switchgear, automatic synchronizing, incoming line and feeder panels
  - C. Medium-voltage generator switchgear with swing panel and feeder panels



- A. Pedestal-type induction motor driving blower thru gear speed increaser
- B. Induction motor driving fan thru adjustable-speed magnetic drive
- C. Bracket-type induction motor on a draft fan application



- A. Medium-voltage, current limiting fuse, contactor type, induction motor controls
  - B. Low-voltage, reduced KVA, contactor type, synchronous motor controls
  - C. Low-voltage, current limiting fuse, contactor type, synchronous motor controls



- A. Vertical synchronous generators, waterwheel driven
- B. Vertical induction motors driving high-speed centrifugal pumps
  - C. Vertical synchronous motors driving high-speed centrifugal pumps

#### Producers Council Pittsburgh Meeting

THE PRODUCERS' COUNCIL exists for one purpose — to promote sales for its members' products. As an affiliate of the American Institute of Architects since 1921, PC has enjoyed a close working relationship in mutual confidence with the Institute and a large percentage of its more than 13,000 members. In 1921, this arrangement was a good one for both groups, but now it appears to be in need of re-evaluation.

#### **PC Courts New Groups**

Of late, PC has shown a growing interest in such organizations as the Consulting Engineers Council, the Construction Specifications Institute, and the National Association of Home Builders. In fact, all of these groups were repre-

sented at the Council's 40th annual meeting in Pittsburgh last September. Cedric Acheson, Syracuse consulting engineer and first vice president of CEC, officially represented CEC as a guest of the Producers' Council.

Though Producers' Council is more concerned with maintaining a high standard of quality in the products manufactured by its members, it is not an exclusive club and has shown a steady growth through the years. At the present time, its membership roster includes almost 130 manufacturers and 30 trade associations. Though it may lose three or four members per year, it seems to be gaining about twice as many as it loses. Thus, as the membership slowly expands, PC's in-

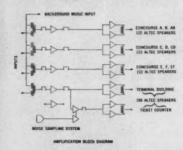
terests also are tending to broaden. But, it probably will be a long time before the consulting engineers or any other group begins to feel as comfortable with Producers' Council members as do the architects.

#### **Local PC Chapters**

Actually, the important activities of Producers' Council are carried on by autonomous chapters located in 45 cities. The men in these local "salesmen's clubs" are keenly aware of the importance of the consulting engineer, and are actively attempting to provide him with the kind of sales services that he needs. It will only be a matter of time before this enthusiasm filters up to the PC national board of directors. Of course, the message already is

## ALTEC AIRPORT SOUND SYSTEM SPECIFIED FOR INTELLIGIBILITY AND FAIL-PROOF OPERATION!





#### Sound Solutions to Sound Problems:

CASE HISTORY FILE 61-28: The new Atlanta Airport required an "arrival and departure" announcing system to service the multi-level terminal building and six radial concourses with intricate connecting passageways.

SOUND PROBLEM: The system selected had to provide failproof clarity of speech and virtually fail-proof operation to meet the demands of jet age traffic.

SOUND SOLUTION BY ALTEC: An Altee airport sound system, with over 500 Altee speakers, was selected and installed. It provides clear, intelligible arrival and departure announcements at all times and in all areas through its unique capacity to automatically adjust sound levels to compensate for frequent high intensity noise generated by jets. Optimum reliability is provided by a new Altee safety system

that offers the most perfect protection against failure yet developed. Even if half of the amplifiers in the system become inoperative—and this is an extreme example—it will continue to function with normal effectiveness!

Custom Altec sound systems offer advanced solutions to modern audio needs in all industrial, commercial, institutional, and entertainment fields. For technical information on your requirements, merely call an Altec Sound Contractor (listed in your Yellow Pages) or write Dept. CE-11.

ALTEC SOUND CONTRACTOR: BAKER AUDIO ASSOCIATES, ATLANTA, GEORGI



ALTEC LANSING CORPORATION

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A Subsidiary of Ling-Temco-Vought, Inc.

# Consulting Engineers... Specify over 50% of all Superior PACKAGED BOILERS

Qualified by both training and experience to specify for their clients boiler equipment which meets the requirements of the installation and complements the consultant's selection by its record of performance, Consulting Engineers are responsible for more than half of the Superior Packaged Boilers installed.

This interesting fact was revealed in a recent market-analyzing survey of Superior Sales Engineers when they were asked who was responsible for the purchase of the boilers they had sold in the past year.

There is a reason for this in basic principles of engineering design which make Superior Boilers pay dividends in long-lived satisfaction to their owners.

Skilled in evaluating boiler equipment feature by feature, Consulting Engineers appreciate Superior's conservative capacity ratings based upon a full 5 sq. ft. of heating surface per unit of Hp. They realize that Superior's 4-pass design . . . their induced draft . . . their dependable rotary burner for firing gas or oil

. . . and their dimensional compactness . . . are features which result in installation and operating economies for the owner, as well as favorable recognition for the consultant.

And last, but not least, Consulting Engineers appreciate the importance of unit responsibility . . . that Superior Packaged Boilers are shipped complete, after factory fire testing, and are backed by the undivided responsibility of their maker.

Superior Packaged Boilers are engineered and produced by a manufacturer who is dedicated to packaged boilers exclusively...a firm which is as proud of its product's reputation for performance as is the Consulting Engineer of his professional standing.

These are all good reasons why YOU should choose a Superior Packaged Boiler for YOUR installation.

Fire tube boilers for steam or hot water are supplied in sizes to 600 Bhp. Water-tube boilers up to 72,000 lbs./hr. For complete details, write for Catalog S-13.

Fire-Tube and Water-Tube PACKAGED BOILERS

for STEAM or HOT WATER

SUPERIOR COMBUSTION INDUSTRIES INC.

TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.



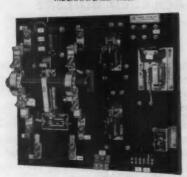


#### AUTOMATIC TRANSFER SWITCHES ...

engineered to assure continuous power, safeguard life, property, production.



MECHANICALLY HELD



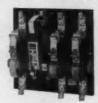
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#### MAGNETIC CONTACTORS...

reliable power switching, rugged durable design.



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ELECTRICALLY HELD

Zenith Automatic Transfer Switches and Contactors are rated from 30 to 600-amps., 250 and 600-v. operation.

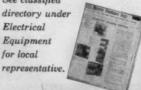
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- **Special Relay** Controls
- **Program Clocks**
- Interval Timers **Reset Timers**
- **Cycle Timers**
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See classified directory under Electrical

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getting through, as indicated by this year's PC-CEC Manufacturers Literature Competition and by the continuing activities of the PC-CEC joint committee.

#### **Seminar Activities**

One of the more important activities of the Producers' Council has been the planning of technical seminars for architects, engineers, and builders. Three have already been developed, one on roof construction, one on curtain wall construction, and another on air conditioning. These seminars are prepared by national committees for presentation at local chapter meetings. They are costly both in time and money, but one of the biggest problems the Council has had is to decide just who they are talking to. For example, chapter presidents report that the air conditioning seminar was primarily designed to keep architects abreast of developments in this field. However, when the local chapters sponsored a presentation, it was primarily attended by consulting engineers, and the program was pitched at too elementary a level for such an audience. Producers' Council undoubtedly will face more and more problems of this type in the coming years. That its national board of directors should develop adequate solutions is mandatory to the future success of the Council.

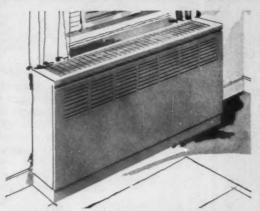
#### **New Officers and Directors**

New officers of Producers' Council elected in Pittsburgh include: president, Elmer A. Lundberg, Pittsburgh Plate Glass Co.; 1st vice president, Don A. Proudfoot, Barrett Division, Allied Chemical Corp.; 2nd vice president, Charles S. Stock, American Air Filter Co., Inc.; secretary, Earl F. Bennett, Koppers Co.; and treasurer, Harold L. Cramer, Westinghouse Electric Co. New directors include: William H. Hunt, Georgia-Pacific Corp.; John P. Jansson, Olin Metals Division; and W. H. Slemp, Kaiser Aluminum and Chemical Sales.

#### **NEW CARRIER REHEAT WEATHERMASTER SYSTEM** ... WHERE and WHY you can use it to advantage!

Now you can capitalize more often on the unique advantages inherent in all single duct, constant volume air conditioning systems with reheat at room terminals. The new Carrier 36BA Reheat Weathermasters\* permit use of either high or normal velocity primary air. Four reheat coils are now available in each unit size. And you have a wide selection of new modular cabinets and furred-in arrangements.

You can select units more economically to meet cooling capacity and sound control requirements, with the assurance that they will also be able to match almost any heating load -regardless of geographical location, exterior glass area, or limitations of existing steam or hot water plants. For complete information on the new Carrier Reheat Weathermasters.



write for the 8-page catalog, 36BA86. Carrier Air Conditioning Company, Syracuse 1, N. Y.

#### WHERE:

Existing office buildings, hospitals and hotels, regardless of size, where present steam and hot water services are in good condition. Units replace radiators; only supply air duct system need be added.

Schools, where high ventilation capacity and ease of automatic room temperature control make this system very suitable. May be applied for heating and ventilating only, with cooling added later at low cost.

Laboratories, where precise control of both humidity and temperature is a requirement.

New small office buildings, where it is usually impractical to apply a high-pressure induction system, yet a quality system at low cost is wanted.

#### WHY:

All-air cooling assures superior ventilation and odor dilution.

Induction at unit permits smaller ducts, lower fan horsepower, gravity heat.

Constant volume supply air speeds system balancing, maintains constant air motion.

Constant temperature supply air simplifies central station apparatus, provides maximum humidity control.

Central station design eliminates service in occupied spaces.

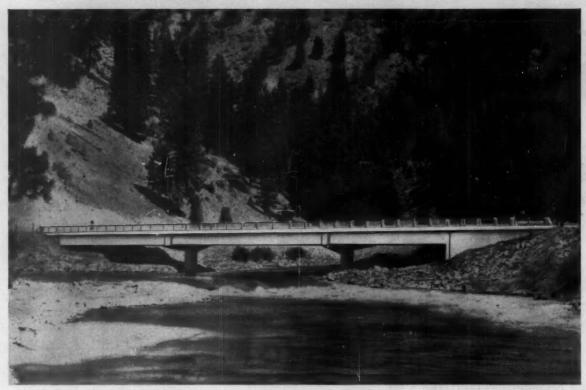
Reheat at unit provides best possible control, solves zoning problems.



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#### AIR DISTRIBUTION CONTROL Corrugated galvanized steel serves as form for finish floor slab and forms the top of an unobstructed air plenum. Baffles are used to zone air to desired areas. Perimeter discharge opening can be continuous or A-E FLOOR COMPLETE spaced as desired. Sill can be located at any height -important in curtain wall constructions. Speedy placement of air terminals, air grilles, and standard electrical outlets completes your A-E Floor System. For additional information and details, write for A-E Floor catalog No. AE-601 (A.I.A. File No. 30). GRANCO STEEL PROD-UCTS CO., 6506 N. Broadway, St. Louis 15, Mo. A Subsidiary of Granite City Steel Company. A-E FLOOR GRANCO E FLOOR • TUFCOR® • CORRUFORM® • COFAR® E/R COFAR® • ROOF DECK • UTILITY DECK • RANCO VIN-COR•S•F BRIDGE FORMS®•PAYEMENT JOINTS • FREE FLOW SUBDRAIN



274' Continuous Girder Bridge over South Fork of Payette River, Boise County, Idaho Designers: Bureau of Public Roads
Contractor: Hansen & Parr Construction Co., Spokane, Wash.

## Increase the effectiveness of your highway budget with Monolithic REINFORCED Concrete

Keep the cost of your highway structures down by designing for reinforced concrete. Recently published cost figures for 14,703 federal aid bridges show that 2 out of 3 bridges were constructed of reinforced concrete at an average of approximately \$350.00 less per lineal foot than bridges constructed with other materials. On your next project, investigate this lower cost construction material and compare its savings.

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9-61

CONSULTING ENGINEER

#### Building Congress Adds Consultant Interest

Despite an improved program this year, the Second Industrial Building Congress had fewer exhibitors than last year.

THE SECOND Industrial Building Congress, held in New York City in late September, has been dissected conversationally many times since its closing.

The first Congress last year was held during the unlucky week of one of New York City's largest snowstorms. As far as the consulting engineers were concerned, the program had little to offer, because all facets of the building industry except consulting were well covered. However, the exposition had a healthy list of exhibitors. Because of the bad weather, at times there seemed to be more exhibitors than visitors, and quite a few of last year's companies did not come back to this year's show.

This year the program was greatly improved. Many of the topics were of direct interest to consulting engineers, and several prominent consultants were on the program. But the exposition itself did not fare too well.

#### Consultants Discuss Costs

At the Congress sessions, Milo Ketchum and James M. Hastings presented a paper on "Estimating Construction Costs for Decision Making." Both men are with Ketchum, Konkel & Hastings, structural consulting engineers, of Denver, Colorado. Ketchum probably was surprised to see his name listed in publicity releases as "among the internationally known architects to address the session."

According to the Denver consultants, estimating to a contractor means the assembly of a bid from prepared plans. To the engineer or architect it may mean:

¶ A quick square foot or cubic foot cost based on sketchy floor plans. ¶ Comparative costs of structural systems to convince the client that he is getting the best system possible for his money.

¶ Comparison of costs of finish materials to obtain the best appearance at the lowest cost.

¶ Estimates on preliminary plans—accurate, yet set up in such a way that the client himself can choose between expensive materials or equipment with a high budget and cheap materials or equipment at a rock bottom cost.

¶ A memorandum to the owner indicating that the extra four feet in height is going to put his building way over the budget.

¶ At last and probably not least, an accurate and reliable estimate prepared from the final plans (before they go for bids) that will be between the first and second lowest bid from the contractors.

Ketchum and Hastings gave the remainder of their discussion in a series of questions and answers:

How do you convey the idea to the owner that estimates cannot be precise?

In the first place, on your initial estimates, give a range of costs rather than a single figure. For example, tell the owner that the new building will cost from \$120,000 to \$132,000, based on the present range of bidding.

Also, you should point out the facts: It is normal for bid prices to vary as much as 20 percent. The estimate of the engineer or architect cannot be expected to be precise. By the laws of statistics, every so often an estimate will be considerably in error due to no fault of the estimator.

How do you get reliable unit costs from contractors in order to prepare estimates yourself?

Contractors, like others, have their pride. To many, unit prices are their stock in trade and they resist attempts to divulge them to the engineer or architect. We have had the best success in computing the quantities ourselves and then hiring the contractor, at a decent fee, to advise us on our unit pricing. "Free estimates" by contractors are worth what you pay for them. Contractors like to be considered professional people, and respond to treatment as professionals.

The engineer or architect should take every opportunity available to review costs with contractors, especially on cost-plus work where estimates and guaranteed maximum prices are a part of the contract negotiations.

How do you keep the client informed of changes in scope of a project?

It is a rare building for which changes in finishes or size are not made after the preliminary estimate. Unless the owner is constantly informed of the ebb and flow of

#### FOR REPLACEMENT OF EXISTING UNDER-GROUND LINES AND FOR NEW CONSTRUCTION



Concrete "sidewalk" set to line and grade affords accurate alignment for 8" steam pipe.



Glass fiber block-out at loop entrance provides positive void space for lateral movement of piping.



Pipe loop leg will move without restraint within inverted metal pan block-out.



Completed expansion loop enclosed with watertight membrane ready for backfill.



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#### ANSWER!

at Eastern Washington State College

MECHANICAL CONTRACTOR: James Smythe Plumbing & Heating, Spokane, Washington

CONSULTING ENGINEER: H. Jack Reeves, Spokane, Washington

CTC CERTIFIED CONTRACTOR: Vermiculite Contractors, Inc., Seattle, Washington

Recent underground work on the campus of Eastern Washington State College, Cheney, Washington, called for the installation of 2100 feet of new high-temperature steam distribution lines, expanding the capacity of the system served by existing lines and extending lines to areas of new construction. "Z"crete insulating Concrete Conduit was selected for performance and permanence, and the assurance of recognized competence and integrity contributed by the CTC contractor, Vermiculite Contractors, Inc., who assumed responsibility for installation.

The advantage of field fabrication afforded the flexibility to work around unanticipated underground obstructions and permitted minor changes in alignment with a minimum of delay and expense. Drainable, driable "Z"crete Insulating Concrete Conduit with its tough, temperature stable watertight membrane enclosure is increasingly the choice of consultants and contractors for soil conditions similar to those at Cheney where standing water in spring and fall, and irrigation of grounds during the summer, subject the underground system to the hazards of water penetration.

There's a Certified CTC Contractor near you familiar with your soil and ground water conditions and expert in both counsel and installation of the "Z" crete brand system matched exactly to your requirements. Let us put you in touch with him now. There's no obligation, of course.

Send for BULLE-TIN NO. 38 including the name of your nearest contractor



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costs of those changes, the building cost will grow and grow until the consultant's preliminary estimate is no longer valid.

Therefore, a standard form should be used to inform the client of changes made in design, which increase or decrease the estimated cost of his building.

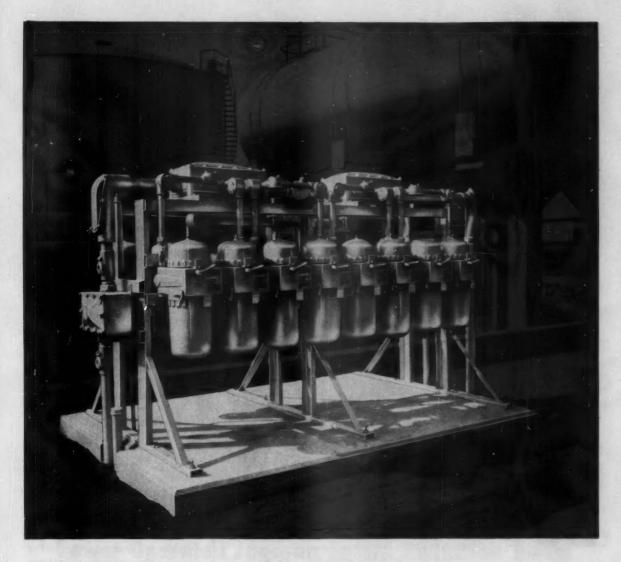
Why make comparative cost estimates of structural systems or materials?

Comparative cost estimates of materials are made for two reasons: to obtain the difference between the cost of alternate materials, so that the general estimate can be revised; and to obtain the cheapest material among a number of alternatives. In some cases both purposes may be accomplished by the same estimate.

For example, a new design may be very much like a previous design except that brick walls are required instead of concrete block. It is necessary only to find the difference between the cost of the brick and concrete and add it to the cost of the previous building to obtain a fair estimate. In such a procedure, it may be necessary to make allowance for contractor's overhead and profit.

The second type of materials estimate is especially necessary in the case of special structural systems. Ketchum's firm has been involved a number of times in the selection of steel or concrete framing systems for tall buildings. Final comparative cost usually does not hinge on the cost of the framing but on the cost of electrification in comparative cost estimates, even though the problem of evaluation of the life of materials or savings in insurance is more difficult to justify to the client.

The structural system represents a large portion of the cost of an industrial building, and comparative cost studies are often made of structural systems. In such an estimate, the absolute cost is less important than the comparative cost



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Crouse-Hinds long experience in the design and construction of control racks insures safe, correct compliance with your specifications, from the simplest to the most complex.

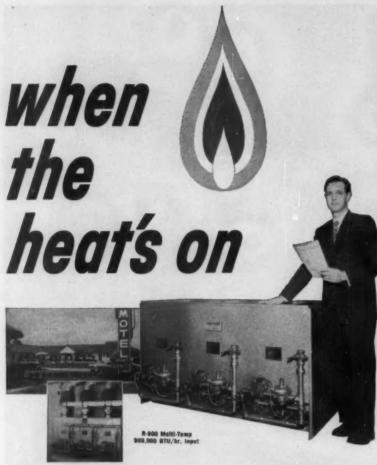
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so that a decision can be made between several alternatives.

Would you describe the procedure for obtaining a building acceptable to the owner in cost and quality?

¶ Establish a building budget with the owner. This will serve to control the design limits and the size of the building.

¶ Determine the area limits by applying per square foot costs based on the type of building. For example: warehouses — \$5 to \$8 per square foot, industrial buildings — \$6 to \$9 per square foot, and office buildings — \$12 to \$18 per square foot, are typical costs.

With the size of the building established to the satisfaction of the client and the engineer or architect, determine the structural system, the heating and ventilating system, and the electrical system. The systems selected must be fully acceptable to the engineers concerned. Make comparative cost estimates for alternate systems.

¶ Select, with the client's approval, the architectural finishes for walls, floors, ceilings, doors, and windows. Review the fire protection requirements. Select alternate finishes.

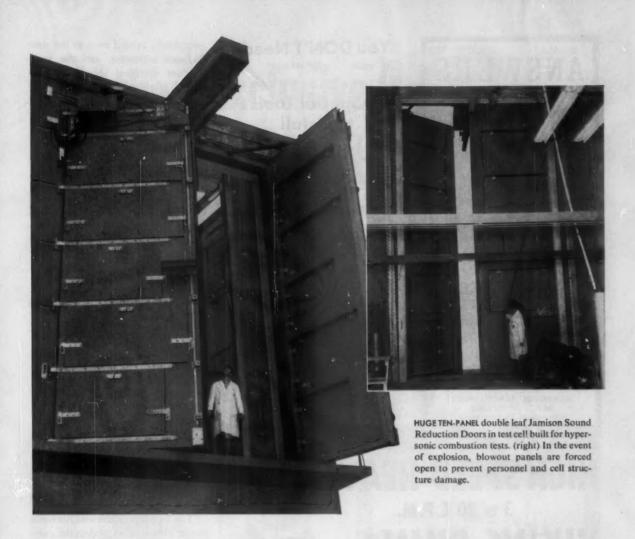
Testablish the basic preliminary design and the detailed basic preliminary cost estimate. Use costs for the most economical of the acceptable systems as a base. For example, use concrete as a base, brick masonry as an added item, and use gas fired unit heaters as a base with hot water radiant floor heat as an addition.

¶ Review floor areas as required to fit the client's budget.

¶ Establish an acceptable solution with the owner on the basis of the foregoing procedure.

¶ Begin preparation of working drawings as soon as possible.

The engineer or architect must know a great deal about approximate cost of many materials. He must be able to make "on the spot" decisions that will greatly affect the preparation of plans. His estimating problems cannot be



#### Power Operated Jamison Sound Reduction Doors Protect Against Explosion and High Level Noise

At the Wright-Patterson AFB, Dayton, Ohio is one of the Air Force's newest and most important test facilities devoted to research in the fluid dynamics of air breathing and non air breathing propulsion systems. Jamison Sound Reduction Doors have been chosen here to provide protection from both explosion and high level noise ... These Jamison doors are built with blowout panels which would be forced open by an explosion, thus dissipating the sudden force of any violent detonation.

Ram jet engine testing, which reaches a noise level of 120 decibels, is reduced by approximately 50 decibels by these same doors. Detonations in test equipment, moreover, are expected to reach pressures greater than 3,000 atmospheres.

This is another example of the successful application of Jamison's knowledge and experience in this specialized field. If you have a noise problem, it will pay you to call on Jamison for a practical, economical solution. A new bulletin describes Jamison Sound Reduction Doors and contains interesting new test data. Write for your copy to Jamison Cold Storage Door Company, Sound Reduction Door Div., Hagerstown, Md.





#### E-M POWER QUIZ

on pages 144-145

2. C

9. C 10. C

3. A

11. B

4. B 5. A 12. B 13. B

6. A

14. B

7. C 8. B

15. B

NOTE: Don't feet too badly if you NOTE: Don't feel too badly if you didn't get them all right. Application engineering takes years of experience. Each description in the Power-Quiz (all 45 of them) represents an actual application problem solved by E-M. May we help you with yours?



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#### You DON'T Need

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or Special Tools to install



Cable Support Systems

Chaffant Splice Plates and Trays are secured fastened by the exclusive Chaffant Crimm Method. . to reduce installation time below conventional methods. Lower costs also achieved with Chaffant systems because applies plate and tray is made from a quality, longer lasting, economical Aluminia.

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completely turned over to the professional estimator, and the engineer or architect should become versed in estimating techniques.

#### **Client Experiences**

Paul Spellicy, chief architectural engineer for Ford Motor Company, told of his firm's experience with outside architects and engineers during an expansion and modernization program that reached peak expenditures of \$35 million to \$40 million per month. With a plant engineering staff of 280 persons, Ford also used eight major architect-engineer firms. In selecting these firms, Spellicy contended that:

"The architect-engineer's organization must not only be well integrated for the design work and geared to meet today's most specialized demands, but must be able to 'carry the ball' on matters that arise in which the owner does not have time to become involved, such as problems related to building departments, appeal boards, and other building regulatory agencies. An experienced firm anticipates difficulties before they actually occur and thus is able to avoid crises which are costly and delay the completion of the project.

The location of the architect-engineer also was an important consideration, because, during the design phases of the project, almost daily contact with the firm was required. We have found through experience that a large number of firms with proven performance for designing facilities related to the automotive industry were located in the Detroit area. Consequently, the majority of our design work was accomplished by local firms."

#### General vs. Specialty Contractors

J. D. Petersen, manager of the Goodyear Tire & Rubber Company, engineering division, discussed the advantages of segregated versus general construction contracts.

He began by explaining that Goodyear uses its own engineering staff on tire plant projects, but re-

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- lube oils
- e solvents
- e alcohol
- · other liquids



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## Another\* Exclusive **Product**



THREADED TYPE

FORGED STEEL WELD COUPLETS

The Vogt Weld Couplet is an easy-to-install fitting for branch connections from pipe, vessels or tanks. It replaces more-difficult-to-install welding bosses, couplings and the type of fittings requiring trimming or matching to fit contour of vessel or pipe.



Exclusive Voot "WELD RING"

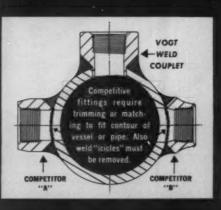




Large Diameter Vessel

Vogt Weld Couplets adapt to any pipe or vessel curvature by simply adjusting the height position of the couplet when welding. This characteristic means easy installation, positive positioning and alignment, a stronger weld without distortion, and no inside "icicles" of welding material.

Couplets are available in carbon steel, conforming to A.S.T.M. specifications. Other materials can be supplied on special order.



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NOVEMBER 1961



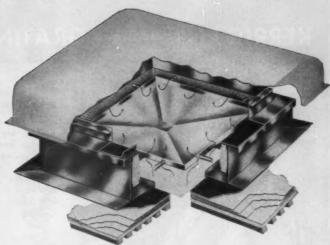
tains outside services for chemical or synthetic plants.

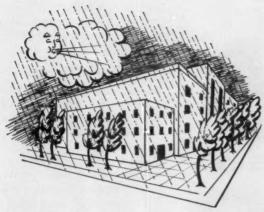
Petersen said that, when selecting contractors, "It is not our practice to invite open bidding by all who may be interested. In a locale where we have done business before, we select those local contractors with whom we have been satisfied and whom we know are capable of handling the job. In a new locale, we obtain recommendations from reliable local sources on who should be invited to bid. Bids are then requested, on a lump sum basis, or on some other basis, if special conditions dictate, such as unit price, cost-plus, or labor only. Competitive lump sum bids are the most common and most desirable, but they should be broken down for detailed comparison. If a component cost is out of line, we may check with the contractors and call for rebidding. Whether we ask a contractor to bid again on another portion of the same project depends on his performance. Cost and delivery then determine the successful bidder.

"Segregated contracts are let to specialists in each particular trade, to take advantage of the newest cost-saving innovations and equipment, which these specialists are likely to develop first in order to gain advantage over their competition. When they bid on the first block of work in a big project and there is more to follow, they have an incentive to bid low to get in on the site with their crew, giving them an advantage in subsequent bidding. Once they are on the site, they have to continue bidding low on lump sum jobs to stay on the site...Cost is an important factor in contracting, and, in my opinion, the cost advantage lies with segregated contracting."

George K. Heebner Jr., president of George K. Heebner Inc., Industrial Engineers, Designers, and Builders, Philadelphia, told of a Philco project that went "From Management Decision to Operation in One Year." He gave Philco

#### FORGET WATER DAMAGE FOREVER





#### The ULTRA SONOTROL CURB\*

Now, there is no need to compromise the many advantages of exhausting or supplying air through roof mounted, powered and/or gravity ventilators because of possible leaks. Before the development of the ULTRA SONOTROL Roof Curb every hole provided for a ventilator opening was a potential trouble spot.

If you want to get air in or out an opening is required. Our nearly 35 years in designing, manufacturing and marketing roof ventilators has taught us no matter how protected that opening may be, it cannot be 100% watertight under every conceivable condition of wind, storm and weather.

The ULTRA SONOTROL fills the breach. Its exclusive Storm Shield serves as a built in drip-pan. Hurricane gales cannot drive moisture in to water stain ceilings and to buckle or warp wooden floors and joists. The Ultra Sonotrol effectively attenuates sound and with a minimal pressure loss. It also has all the advantages a factory fabricated roof curb has over the uncertainness and expense of field construction.

The curb and ingenious Storm Shield make the best uses of corrosion free fiberglass and aluminum. All water particles that may enter gravity or powered ventilators or fresh air intakes are trapped by the Storm Shield. Water is held until evaporated or passed to the roof through an optional drain tube. No part of the assembly projects below the roof deck to interfere with structural supports.

Read more about this latest Penn Ventilator engineering achievement and how you can eliminate the risk of water damage during severe and extreme weather periods. Send for your copy of Bulletin SC-90 today.

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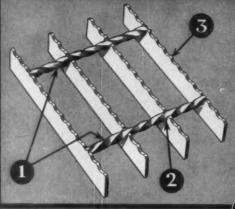
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officials much of the credit for this time saving.

"[This] flexibility on the part of management - this cutting of needless red tape - was one of the main reasons the job was completed with such great speed. It was an important 'plus' that cannot be overemphasized. The Philco officials made decisions when we needed them - and they made them fast. They shortened the lines of communication and approval within their own company. This streamlining of the chain-of-command by Philco could well serve as an object lesson for other companies involved in the construction of new plants where speed is a factor - and it most often is in this highly competitive era. Even a month's delay can mean the loss of a large share of a market in some industries."

#### **Air Conditioning Controls**

Russell F. Stem, associate, Smith, Hinchman & Grylls Associates Inc., Detroit, told of current practices in heating, ventilating, and cooling in modern plants.

The greatest problem in the selection of any control system is making certain the owner knows the limitations of the selected system. Many people feel once a control system is installed, it can be made to do anything. As consulting engineers, we feel a control system should be designed around the job requirements, and not endeavor to make a job work to a certain type control system."

Stem also mentioned the importance of a good maintenance department head for the client. He told of one installation with "a maintenance chief who is extremely well qualified for his job. Needless to say, there are no problems with this system, and we have a happy owner." Another example, with a maintenance man who invariably turns the wrong valves so the systems do not function properly, has an owner who continually wonders what is wrong with the air conditioning design.



## CONTACTOR IN PLACE

... speeds Limitamp control inspection and maintenance

Maintenance is an easy job with General Electric's draw-out Limitamp control. Routine maintenance is quickly performed with the contactor in place.

Coils and contact tips can be changed in minutes. Simply lift out the arc chutes and one arc horn to expose the bolts holding coils and tips in place.

To make your job still easier, a magnet-head wrench is supplied with units. This wrench fits all bolts necessary to change coils and tips. Remember . . . Limitamp control is all front connected.

To replace fuses, you just pull the ejector and the fuses pop up. When a fuse is replaced, it is guided into position by a back-stop on the clip.

tion by a back-stop on the clip.

Another feature is a special test circuit—built into each control. Bring in external power and connect it to the terminal board. You can then safely operate the panel—automatically iso-

lated from normal power source with the door open—to check out the unit before putting it in service.

Ask your G-E Sales Engineer or Agent about other advanced-design maintenance, installation, operation, and performance features of Limitamp control. Or, write Section 783-25, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

\* Reg. Trade-mark of General Electric Company.

Progress Is Our Most Important Product





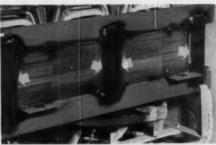
dry-type transformers



Research and testing in anechoic chamber of General Electric sound laboratory help maintain low sound levels of QHT transformers.



Built-in vibration-dampening rubber cushions isolate the rugged case of General Electric QHT transformers from core vibration, main source of transformer noise.



Welded steel clamps on higher ratings of General Electric QHT dry-type transformers keep the core laminations firmly in place to minimize vibration and reduce sound.



| KVA          | OHT<br>DECIBELS† | NEM A<br>STANDARI |  |
|--------------|------------------|-------------------|--|
| BELOW 5      | 40               | 45                |  |
| 5-9          | 45               | 45                |  |
| 10-30        | 45               | 50<br>55          |  |
| 371/2-1121/2 | 45               |                   |  |
| 150          | 45               | 60                |  |
| 167          | 55               | 60                |  |
| 225-300      | 55               | 62                |  |
| 500          | 60               |                   |  |

<sup>†</sup> Measured per NEMA Standard St. 1.411. The average office has sound levels from 55 to 65 decibels.

#### How General Electric Designs "Quiet" Into QHT Dry-Type Transformers

Choosing the quietest transformer for schools, hospitals, office buildings, and other places where noise could be a problem is now easier than ever. General Electric's new line of QHT dry-type transformers is at least 15 decibels quieter than older designs, and the actual rating appears on each transformer. As the chart below shows, each rating of QHT transformers has a sound level equal to or less than the NEMA standard.

Full-time research and testing in General Electric's sound laboratory provide General Electric engineers with information needed to design and maintain the low sound levels of QHT transformers.

Vibration is minimized on larger size units by welded steel clamps which hold the transformer core in a rigid position. In addition, on QHT units rated 30 kva and up, vibration-dampening rubber cushions isolate the case from the core and coil assembly. Consequently, core vibration passing through mounting brackets and conduit to surrounding surfaces is practically eliminated.

QHT transformers also save production space because they offer savings up to 50 percent in weight and 67 percent in size compared with competitive dry-types. You can mount QHT units in out-of-the-way places near the load and save the cost of long, low-voltage feeders.

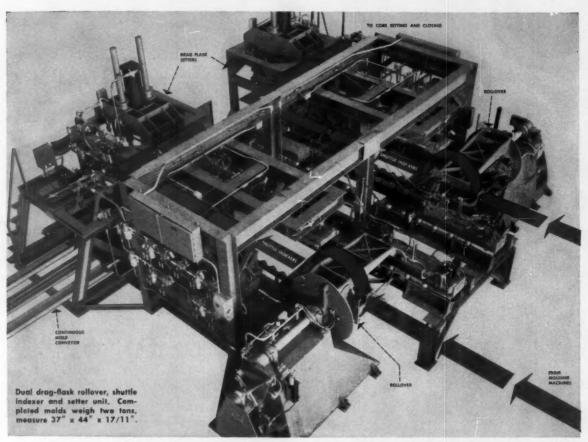
Installation is fast and easy. You wire QHT transformers from the front. Convenient dual-sized knockouts, large terminal compartments, solderless connectors, and numbered terminals save time.

You can get 24 hour delivery on most models from your nearby General Electric distributor. Call him for more information, or write for GEA-6907A "QHT Specifier's and Buyer's Guide" to Section 411-15, General Electric Co., Schenectady 5, N. Y.

\*Registered trademark of General Electric Co., for quiet, high temperature, dry-type transformers.

Progress Is Our Most Important Product





#### Planet system automatically removes and positions 250 one-ton flasks an hour on moving conveyor

To design a system that will strip and close flasks automatically on a continuously moving conveyor has always been a perplexing problem. But Planet Corporation solved this problem for one of the automotive industry's largest foundries . . . and at the same time provided the key to increase productivity approximately 400%. In addition, this unusual system provides maximum casting flexibility and operational reliability.

#### Flask Handling System Operation . . .

Following molding, the drag flasks are fed into the dual drag-flask rollover, shuttle indexer and setter unit (see diagram). The flasks are rolled over 180°, then indexed to the unique in-flight setters which accurately positions them on the continuously moving car-top mold conveyor. From this point, they are moved through core setting to the dual cope-flask-closing unit. The cope-flask subsystem, from molding to closing, is similar to the drag-flask unit except rollovers are not required.

After pouring and cooling, the cope-flask-stripper unit lifts the cope flask off the drag. The drag flask continues on the mold conveyor to the drag "pick-off", or lifting, device. On their removal from the conveyor, the flasks are recirculated through the system. Both removal operations are performed while the mold conveyor moves as a constant speed.

This integrated materials handling system increased productivity approximately 400% and resulted in substantial cost savings

#### Production Flexibility . . .

With this flask handling system, it is possible to produce either six-or four-cylinder blocks or both simultaneously. This feature provides this large automotive foundry with

maximum casting flexibility . . . a maximum capacity of 500 blocks an hour.

Flasks handled by this system are controlled electrically and are locked at each position. They are parted or joined by lifting or lowering movements to eliminate damage to parting surfaces. The control system, which required more than 10 miles of wire and 600 relays, includes a feedback feature which allows pinpoint maintenance.

For additional operational reliability, this system was shop wired and piped, and shop tested.

#### An Example of Planet Versatility . . .

This is one example of Planet Versatility . . . Planet Corporation's ability to engineer, fabricate and install custom equipment that solve materials handling problems. Planet Versatility means you'll benefit from our diversified experience gained through service to leading corporations. It has paid them to plan with Planet . . . it will pay you, too! Write or call for complete information. for complete information.

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- 1832 SUNSET AVENUE Automation Equipment
- 13 LANSING, MICHIGAN . Mill & Foundry Equipment



#### Pricing for [Engineering] Services

"Two factors often make it less likely that the average consumer will consider possible substitutes when he is purchasing services. First, services are by definition intangible, and it is often difficult to establish objective criteria by which the good, better, or best service can be distinguished.

"Second, largely because of the lack of standards and of the technical difficulties involved in making comparisons, buyers of services frequently must rely on the good faith and integrity of the sellers with whom they deal. Buyers of goods are protected by various express or implied warranties; these, however, are usually absent in the sale of services. While sellers and buyers of goods usually negotiate at arm's length, the relationship between sellers and buyers of services is often highly personal, even confidential. These personal relationships, it seems, play an important part in the selection of a particular seller of services, and frequently can [function to make] substitute services less satisfactory.

"It has already been observed that, owing to technical considerations and a lack of standards, purchasers of services may have little knowledge concerning the quality or type of alternative services available. In addition, many sellers of services, particularly in the licensed trades or professions, have strict prohibitions against nearly all forms of advertising. These restrictions make it difficult for specialists or more efficient sellers of services to let prospective purchasers know where they might obtain more for their money in terms of either quality or price. Defenders of these no-advertising rules, of course, argue that advertising would have a detrimental effect on . . . standards.

"At least 24 major occupations are subject to statutory regulation as to entry, and most of the occupations may be classified as belonging to the service area. While it is obvious that the public interest may sometimes require that there be various restrictions on entry into certain service trades or professions, laws of this kind go beyond protecting the public from charlatans and incompetents, and become tools for controlling entry and otherwise restraining competition after the fashion of the medieval (craft and trade) guilds.

"It is fairly common for the control over entry into licensed trades or professions to be vested in a board made up of members active in the trade or profession. One writer argues that this '... is on a par with giving the American Iron and Steel Institute the power

to determine the output of steel.' Not only do these member boards control entry, but, in most licensing situations, they have the power to revoke licenses. At times, this power of revocation may be used arbitrarily in ways that restrain both member freedom and competition. Furthermore, individual members of the trade or profession may incur substantial losses due to the unfair or arbitrary actions of such boards, without having any practical means of obtaining redress.

"In some service trades and professions, 'recommended' or 'minimum' fee or charge schedules are set by the members or by boards made up of members. The penalties imposed on members for charging below the schedules may range from ostracism to outright revocation of license.

"It is also well known that some service fees are set on the basis of the purchaser's ability to pay. Economists argue that it is virtually impossible to maintain this type of discriminatory pricing structure unless competitors agree to cooperate, or can in some way be coerced into cooperating.

"On the basis of the foregoing discussion, it seems fair to conclude that the conditions and practices found in many service trades or professions may not fit easily into the competitive criteria used to define free enterprise markets. But a similar conclusion could be drawn concerning many of our industrial goods markets. The really relevant question is whether public policy towards noncompetitive practices and conditions has been the same in both areas." — Charles M. Hewitt and James M. Patterson, in Business Horizons, Summer 1961.

#### Restraint of Trade

"The professions for years had little or no interest in the laws relating to 'restraint of trade' . . .

"It is now suggested by enforcement officials that schedules of suggested fees, in and of themselves, constitute a restraint of trade. The U.S. Supreme Court has held that a fee schedule of real estate brokers in the District of Columbia constituted a violation of the Sherman Antitrust Law. There is presently pending in the Superior Court of Los Angeles an injunction suit brought by the State Attorney General to compel the California Real

Estate Assn. . . . boards to cease and desist from promulgating or adhering to a schedule of so-called minimum fees as compensation for real estate brokers' services. It has also been the unofficial expression of the Office of the State Attorney General that any schedule of so-called minimum fees adopted by an association of professional men, where the association membership represents the majority of practitioners . . . in the area, is illegal.

"Restraint of trade has many variations difficult to encompass in a short definition. But: a restraint of trade is present when contracts, conspiracies, or combinations injure the public by unduly obstructing the free action of competitive forces in trade or commerce.

"The meat of this definition constitutes the Sherman Act, the Federal statute which, in essence, provides that 'every contract or conspiracy in restraint of trade is illegal. Section Two of the act provides that 'every person who shall

monopolize, or attempt to monopolize or combine to monopolize' shall be guilty of a misdemeanor.'" — A. J. Kennedy, in California Council of Civil Engineers & Land Surveyors Newsletter, August 1961.

#### Not Folly After All

"There was evidently some smallscale confusion in Washington one day recently, but nothing to shake the foundations of civilization, as a House subcommittee heard about pumped storage for Federal reservoir projects.

"Lawmakers apparently asked about the sense of using electricity to pump water uphill just so it can run back down again to produce electricity. Actually, according to expert testimony, you may have to use three kilowatts of electricity to get water uphill and you may get back only two kilowatts as it flows back down.

"In the ordinary understanding, water that has gone over the dam is just that, water over the dam,



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#### IMPORTANT NEWS FOR ENGINEERS!



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(Building Officials Conference of America)
FOR COMPOSITE MASONRY WALLS

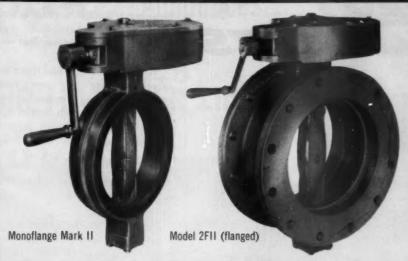
ELIMINATE BRICK HEADERS
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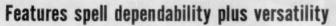


Made of all 3/16" wire or all #9 wire. Made in 12 foot lengths with 4" wide box ties 16" O.C. (9 ties per length). Available finish: Galvanized box ties with brite basic side rods; all mill galvanized wire; hot-dipped galvanized after fabrication.

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#### Do you know how many jobs these Henry Pratt valves can do?



For bubble-tight closure to 150 psi with excellent throttling characteristics and built for flow in either direction. No valves are easier or faster to install. Valves are shown with Henry Pratt's powerful Sidewinder Operator-but a wide range of other operators is offered.

Permanently bonded seat. Will never bunch or bind in use or during installation. Standard seat material is Hycar (Buna N). Various Pratt Resiloseal seat compounds available for corrosives, petroleum, etc. Monoflange MKII features wrap-around design, eliminates gaskets and protects body.

Body. Made of heavy duty cast iron or cast steel.

Streamlined disc . . . minimizes pressure drop. No external ribbing to cause turbulence. Discs are of cast iron, stainless steel, Ni Resist type 1, bronze, or special materials.

Straight through shafts. One piece shafts conservatively sized to resist 150 psi pressure across disc. Standard materials are 18-8 type 304 stainless steel, type 316 stainless steel or Monel.

Nylon bearings. Low friction helps reduce operating torques. No lubrication needed. Other bearing materials available.

Leakproof packing. Chevron type—increases in line pressure automatically increase sealing pressure. No adjustments are necessary and packing cannot bind or gall the shaft. Available with standard adjustable packing if desired.

Write for 50-page catalog for full details on flow rates, etc. Ask for Catalog B-11J.

# WATERWORKS POWER PETROLEUM



PAPER



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METALS

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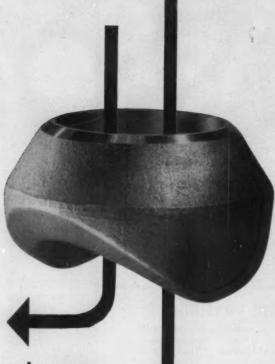
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however, this need not be the case when engineers have their way. For you can store water, but you can't store electricity.

"As one example — and there are others, of course — we have a Federal pumped storage system in operation at the Flatiron unit of the Colorado-Big Thompson project. What happens is this: water flows down all the time. It does not generate enough current to meet peak demands, and it generates too much current to be used up in the nonpeak hours.

"Reversible pump-turbines pump water up into Carter Lake in Colorado during nonpeak hours. Then, when demand for electricity is greatest, the water pumped up with power that otherwise would have been wasted is used to generate current to meet the peak demand. Thus modern engineering uses water power to generate electricity to pump water uphill, and it makes sense." — The New York Times, August 24, 1961.

#### **Publicizing the Highway Program**

"The improvements in equipment today are likewise of great interest and are dramatic. When I was 17, my first job away from the farm was on a road excavating job, driving four horses and hanging onto the handle of a Fresno scraper—at \$6 per day, including the horses. Quite a contrast with today where one of our powerful excavators does the work of a thousand men and horses and Fresnos—and this wasn't so long ago, either. There are many dramatic, interesting stories here that are begging to be

"All these stories are interesting and will be used and read and understood if you put forth effort for your friends of the press. I know full well the general aversion of some engineers to what happens when they try to tell their story to some of our friends of the press—but the fault lies, I think, with us and our approach. We want to utilize the help of the public infor-

## Acree Announces

#### A <u>NEW</u> AIR HANDLER LINE



After years of intensive laboratory and field research and development work, Acme is proud to announce a new advanced-design line of air handlers for heating, ventilating and cooling applications . . . a line that features a host of engineering and construction refinements most wanted by architects, consulting engineers, contractors and building owners nationwide.

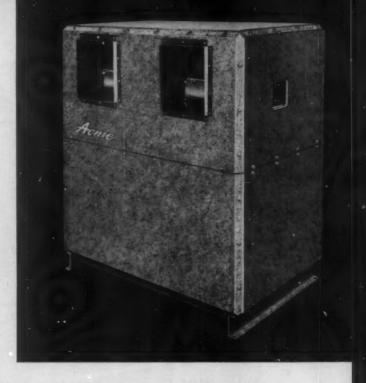
Installation flexibility, for example . . . to meet virtually any requirement you may have . . . is provided in several ways. From two to four coil sizes, in either right or left-hand combinations, are available in each casing size . . . six motor positions and four fan positions are offered . . . and on multi-zone units, mixing and filter boxes may be arranged vertically or horizontally.



All sections are made from rolled sheet steel, angle irons are eliminated, corner post construction offers greater strength and rigidity. Panels, built on specific centers, are securely fastened with self-tapping, hexagon



MANUFACTURERS OF QUALITY AIR CONDITIONING
AND REFRIGERATION EQUIPMENT SINCE 1919



## engineered to your specifications

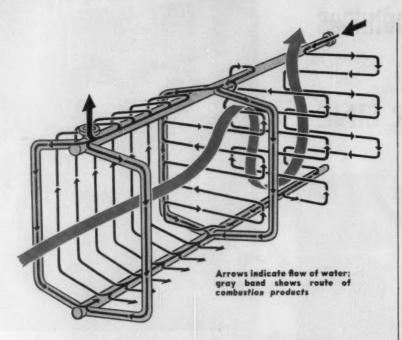
head screws to prevent air leakage, facilitate panel removal when necessary.

Only external, sealed self-aligning "Sealtite" ball bearings with "Alemite" fittings are used to simplify service and maintenance. Fan mount shafts are hollow, designed and sized to minimize shaft deflection, increase bearing life.



There's more, much more... including the fact that the line includes 37 different horizontal, vertical and multi-zone type units, 14 sizes, capacities to 44,000 cfm. An Acme Air Handler for every application. For complete details, fill out coupon below and mail it today.

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| COMPANY    |                                |              |               |     |
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#### Why BROS High Temperature Water Generators Offer You Efficiencies Never Before Available!

If you are interested in truly efficient space heating or in chemical processing which demands precise control of temperatures, it will pay you to investigate the Bros High Temperature Water Generator.

Water vs. steam. High temperature (300° to 450°) water offers you important advantages for heating. Depending on pressures and temperatures, water will store approximately 20 times as much heat as an equal volume of steam. The Bros HTW Generator shown above is especially economical for horizontal movement of large amounts of heat.

Factory-assembled. Bros HTW Generators are completely packaged units. They are efficient, reliable, easy-to-clean, and inexpensive-to-maintain.

The unusual efficiency is due to several features: counterflow of gas and water . . . all heating surfaces consist of tubes (no extended surfaces) . . . deep furnace design which provides long flame travel . . . supereffective insulation.

Combines gravity and forced circulation. Circulation with a Bros HTW Generator does not require orifices at entrance or exit of tube circuits in order to regulate and proportion the water flow. Instead, gravity circulation is used to augment forced circulation. This automatically provides uniform flow throughout radiant tube circuits and virtually eliminates possibility of damage due to pump or line failure.

No thermal shock. Even when return water is reintroduced at temperatures 200° lower than when it leaves, there's no risk of damage from thermal shock.

Capacities, pressures. These compact generators are available for temperatures between 300° and 450°F with corresponding saturated pressures from 70 to 425 psig. Capacities range from 2 million to 70 million btu per hour.

For illustrations, features, drawings, specifications and complete performance data, see your nearest Bros Representative . . . or write

mation departments of the highway departments and similar experts and take advantage of their special skills. Put forth the same type of effort to get understanding as you do in overcoming the other problems, and better progress will be made in reaching the ultimate objective.

"Keep in mind that the vast majority of the folks of the journalism profession are honest brokers between complexities and areas of learning and progress and the ordinary citizen. And keep in mind that the ordinary citizen, Mr. John Q., is eager to learn and to understand and to do what is right.

"You may well remember the words of the song: 'There's a Great Day Coming.' I think the 'Great Day' is here. We have been presented with an unexcelled opportunity to get a lot of work done that badly needs doing. We have the tools, techniques - and with proper understanding there is no limit to accomplishments. The time has come to 'get with it.'" - remarks by Ellis L. Armstrong, president, Better Highways Information Foundation, Washington, D. C., at Regional Conference on Improved Highway Engineering Productivity, Boston, Massachusetts, August 25,

#### **High Frontier**

"In Billings, Montana, the Federal government's eager little workers are scattered through several different office buildings. The General Services Administration, in a seizure of Kennedy-type efficiency, proposes to consolidate all these people in one gorgeous Federal Office Building.

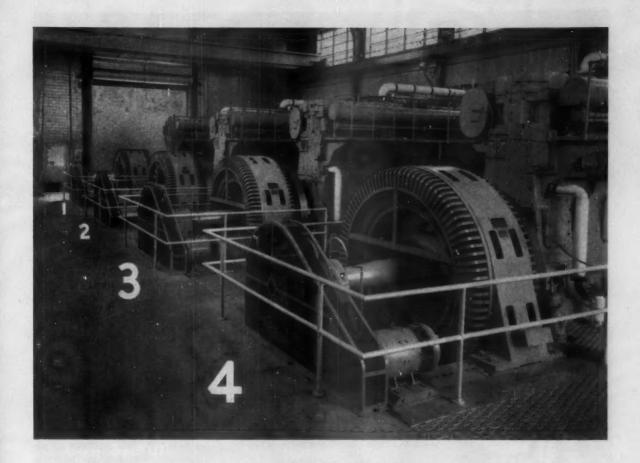
"Mr. Willard E. Fraser, a citizen of Billings and a sharp student of governmental idiocy, informs us that this new building will cost the taxpayers about \$12 million more, over 40 years, than they would pay if they continued as is. The current rental (for privately-owned, commercial properties) would cost the government \$5,941,000 over 40

POWER DIVISION



**BROS** Incorporated

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## Mill Creek Adds FOURTH IDEAL GENERATOR!

Cincinnati's new Mill Creek Sewage Works — one of the nation's finest — has recently installed the fourth Ideal 1350 KW A.C. generator, boosting plant capacity to 120,000,000 GPD.

Designed for optimum efficiency in producing electrical power, Mill Creek incorporates a total of 4 Ideal, 1350 KW, 4160 volt A.C. generators that supply the sole power for this station's pumping, comminution, flocculation, digestion and building lighting.

Ideal low and high speed A.C. generators, from 10 to 10,000 KW, are designed and engineered to meet your most exacting requirements. A nation-wide organization is at your service to help you with the planning and application of your next power project.

For complete information call your nearest Ideal Sales Office or write for Bulletin 510, Low Speed Generators and/or Bulletin 505, High Speed Generators.



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Still Another Reason You're Far Ahead With...

Verli-Line Pumps

# Unique "PERIHEDRAL" 2-WAY Pump Seal ASSURES GREATER OPERATING EFFICIENCY!

If you think all vertical turbine pumps are pretty much the same, you haven't investigated the important "plus" advantages built into every Layne & Bowler "Verti-Line" Pump. Tougher, longer-lived "Moly" Iron at no extra cost to you is one vital "Verti-Line" advantage. Another is the larger-than-standard pump shafting in "Verti-Line" Pumps for greater resistance to costly "twist-offs."

And still another is the unique "Perihedral" Pump Seal found only in Verti-Line Pumps. This seal comuines both vertical and horizontal sealing surfaces between each numb bowl and its impeller.

The vertical sealing surface "A" permits shaft stretch under load without lesing the pump seal.

The horizontal sealing surface "B" permits accurate adjustment at ground level to compensate for wear. Saves time, simplifies maintenance, assures full operating efficiency without complicated adjustments!

Vertical Turbine pumps are the ideal solution to a wide range of modern pumping problems because they save costly floor space, require no priming, are generally simpler to install. But don't be satisfied with ordinary vertical turbine pumps. Specify "Verti-Line" Pumps and get the half-century of vertical turbine pump know-how that is built into every Layne & Bowler unit.

Want More Data? "Verti-Line" Pumps are available in a complete range of sizes to fit all types of industrial applications, from deep-well primary water supply to close-coupled booster or waste disposal applications. Also, laboratory-approved "Verti-Line" Fire Pumps are available for municipal and industrial fire protection. Tell us the type of pump you need and we'll send literature that describes the extra advantages you get in "Verti-Line" equipment.

Verti-Line Pumps are the exclusive products of

LOS ANGELES 22

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years. The new building would rack up the following costs: \$6,516,000 for the new building; \$5,009,-180 in interest charges at 3% percent; \$6,000,000 for operation and maintenance; \$783,556 in local property taxes exempted. Grand total of Kennedy administration thrift: \$18.3 million.

"As if it weren't bad enough to saddle the country with \$12 million of needless expense for office space in Billings, the government in its wisdom adds effrontery to stupidity: for the oil boom has subsided in Billings, and about 30 percent of the town's office space is now vacant.

And they want to start a Federal office of Urban Renewal? — The National Review, August 26, 1961.

#### The Free Enterprise Fight

"This argument as to whether the investor-owned utilities or the Federal government should transmit Colorado River Storage Project power is another chapter in the public versus private power controversy \*\*\*. This discloses an ultimate aim of some of the most vocal advocates of Federal government expansion . . . For centralized political control of electricity would provide the power for . . . political control of . . . business and industry.

"The problem of the electric utility industry with respect to government competition has its parallel in other businesses and professions. For example, the railroads have competition from government-subsidized highway carriers and barges. Even the bakeries are being competed with by the government. In the professions the doctors are fighting socialized medicine. All this suggests the possibility of 'socialized engineering.' Perhaps there is a field of common interest in the electric utility industry and the medical and engineering professions." - Rex A. Tynes, executive assistant, Public Service Company of New Mexico, in the New Mexico Professional Engineer.



In this shopping center of the future, the suspended roof would leave every square foot of interior space completely unobstructed. An artist's conception, yes — but this is no unattainable "dream building." Modern suspended roof techniques pioneered by Roebling make it practical and economical now.

Consider the down-to-earth advantages. Floor space for supports would become paying space instead. Merchandise would be handled, displayed and sold with new ease and efficiency. Customer traffic would move faster with fewer obstructions. Add low first cost and the prospect becomes even more alluring!

Suspended roofs are paying off handsomely in many types of buildings — plants, gymnasiums, airline terminals and hangars, auditoriums, stadiums and others.

Roebling's great experience with steel in tension enables it to take an active leadership in the suspended roof field. This experience is available to you. For information please call or write Roebling's Bridge Division, Trenton 2, New Jersey.



SUSPENSION ROOFS NOW AT WORK . . .
TWA HANGAR – MID-CONTINENT INTERNATIONAL
AIRPORT, KANSAS CITY • Designed by Burns & McDonnell,
Kansas City • Ammann & Whitney, Consulting Engineers, New
York City • Contractors: MacDonald-Creighton, St. Louis and
Nashville • Cables by Roebling



UTICA MEMORIAL AUDITORIUM, N. Y. Architects: Gehron & Seltzer, New York City Associate Architect; Frank C. Delle Cese, Utica Consulting Engineer: Dr. Lev Zetlin, New York City Contractor: Sovereign Construction Company, Ltd., Fort Lee, N. J. Roof Supporting Structure, Including Cables, Furnished and Erected by Roebling

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Branch Offices in Principal Cities • John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

## Leave it to the girls

五年基本 bay. Note power fuses, load interrupters. Fuse refill units are conveniently stored in the door.

They can handle all the maintenance your 2.4 thru 14.4-kv switchgear ever needs...

... if it's S&C Metalclad Switchgear, that is. For S&C Metalclad Switchgear contains maintenance-free fused load interrupters. (Load interrupters handle all load switching; power fuses handle fault protection.) Fused load interrupters will always work—never need adjusting, setting, inspection, dielectric testing, or periodic exercising and lubrication. Compared to the suggested maintenance schedules for circuit breaker type switchgear, there's virtually no maintenance required.

Equally important, unqualified maintenance personnel can't tamper with planned fault protection—since power fuses employ no relays. What's more, the operating characteristics of S&C power fuses do not change with age or current surges. Current-carrying ability and time-current characteristics of these fuses are permanent.

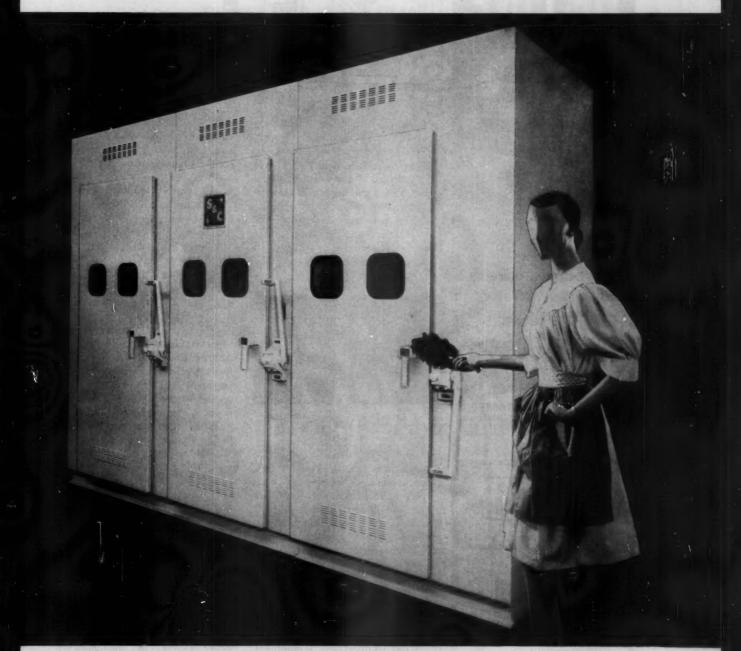
Remember, too, that this switchgear will cost about half as much as the circuit breakers you might be used to. And it offers full-load switching up to 1200 amperes plus fault interrupting up to 500,000 kva in voltages from 2.4 thru 14.4 kv. It meets all NEC requirements for fault-closing and short-circuit interruption . . . and its performance is proved by high-power tests at KEMA laboratories.

Next time you are thinking about highvoltage switchgear for service entrances, switching centers, substation primaries or substation secondaries . . . leave it to the girls as far as maintenance is concerned. As far as application help is concerned, leave it to your S&C sales engineer. Look for him in the Yellow Pages (Electrical Equipment) in all principal cities. Or write to:

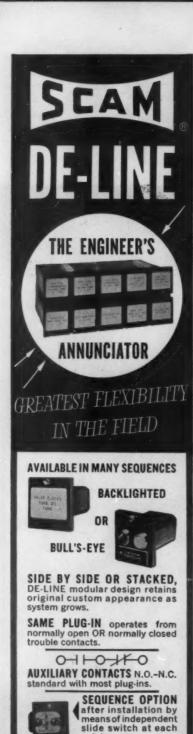


#### S&C ELECTRIC COMPANY

4436 Ravenswood Avenue - Chicago 40, Illinois



Equipment shown is an S&C Metalciad Switchgear Assembly (13.8 kv) used as a switching center. (Dusting is optional!)





#### Men and Firms

Robert M. Arnold has been named president and partner of Beiswenger, Hoch, Arnold and Associates, Cleveland, Ohio. Arnold, who was also elected to the board of directors, joined the firm in 1953, serving as chief civil engineer until he was named vice president in 1958. It also has been announced that the firm has opened new Cleveland offices at 3510 Chester Avenue.



ARNOLD

SAUNDERS

Daniel J. Saunders, formerly vice president of Pfaudler Permutit Inc., has announced the opening of an office at 70 Pine Street, New York City. Saunders will engage in a wide range of consulting services where surveys, specifications, and recommendations are desired covering water and waste problems.

Hugh P. Duffill, president and director of engineering, Duffill Associates, Inc., Boston, and president, American Engineering Consultants Incorporated, Washington, D. C., died on September 22. Duffill was the founder and first president of the Massachusetts Association of Consulting Engineers, and was its delegate to the Consulting Engineers Council.

L. A. Wasselle, project manager, Washington office, Rust Engineering Company, is one of the five members of the second U.S. Trade Mission to Nigeria.

Flewelling and Moody, Los Angeles, announces two new members of its architectural-engineering firm, and the change of name to Flewelling, Moody & Horn. New vice presidents and directors are Aubrey Horn and Ralph H. Flewelling. Horn formerly was vice president in charge of international operations and business development at Daniel, Mann, Johnson & Mendenhall; Flewelling has been design director at Flewelling and Moody for the past five years and holds that position in the expanded firm.

Charles M. Ackley, Lt. Col., C.E. USA (ret.), has joined Engineers Incorporated, of Newark, as project coordinator.

D. Dana Price, mechanical and electrical engineer, announces the opening of his office at 805 Lovett, Houston 6, Texas.

Zarko Sekerez, P.E., announces the formation of a new firm, Zarko Sekerez and Associates, for the

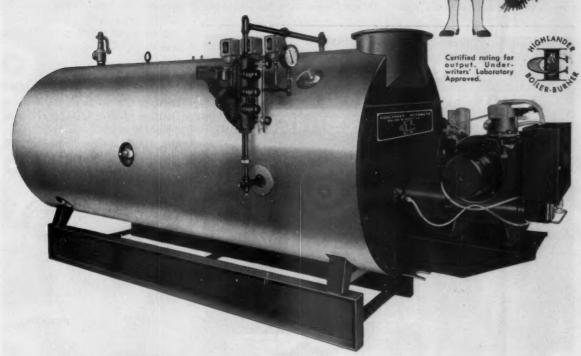
Dept. E, 3101 N. Lowell Ave. Chicago 41, III. AYenue 2-6930

REPRESENTATIVES IN ALL PRINCIPAL CITIES
COMPLETE MONITORING SYSTEMS FOR INDUSTRY

## MEW

#### HIGHLANDER

COMPLETELY AUTOMATIC BOILER-BURNER UNIT





#### YOUR CHOICE OF HEV-E-OIL, MEY-E-DUTY GAS or COMBINATION GAS and OIL BURNER

HEART OF THE HIGHLANDER is the famous Industrial Combustion Burner. The HEV-E-OIL Burner engineered to use inexpensive No. 4, 5 and 6 heavy oils is shown here. Available from 5 to 150 gph. HEV-E-DUTY Power Gas Burners and Combination gas/oil Burners from 720,000 to 21,000,000 BTU.

Write Dept. 8-111 for complete information.

#### PROVEN ECONOMY

SAVES ON INSTALLATION. The new Highlander is a completely assembled boiler-burner plant. Installing one simple unit saves money. Designed by Engineers with years of experience in matching burners and boilers for the exact job—whether it is power, processing or heating. No problem of taking a boiler and trying to match a burner to it. The Highlander Boiler-Burner unit is design-controlled at the factory for maximum reliability.

SAVES ON OPERATION. Designed to get maximum economy from available fuels. The Highlander is built for low pressure or high pressure steam or hot water — Industrial Combustion burner furnished for a heavy oil, light oil or combination of gas/light or gas/heavy oil. Simple! Just 2 flue passes. Easy Maintenance! Boiler interior easily accessible. Reliable! Each burner is completely fire tested at the factory.

#### INDUSTRIAL



COMBUSTION

INC

EXECUTIVE OFFICES: 4447 N. OAKLAND AVE., MILWAUKEE 11, WIS.

practice of consulting engineering. Offices are at 435 West 55th Avenue, Gary, Indiana.

Two consulting engineers have been elevated to the rank of Fellow by the American Institue of Electrical Engineers: Cecil L. Killgore, president, Engineering Consultants, Denver, Colorado, "... for contributions to investigation, planning, and design of hydroelectric systems;" and George Keinath, con-

sulting engineer, Larchmont, New York, "... for contributions to instrumentation for measurement and recording by electrical means."

David E. Austin and Donavon D. Nickel, project engineers of Ketchum, Konkel & Hastings, Denver, Colorado, have been named associates of the firm.

George W. Coleman, formerly with Bendix Corporation, has joined National Engineering Science Company, Pasadena, California, as manager of administration. Coleman is a licensed civil and structural engineer, as well as a member of the California Bar Association.

Lewis S. Goodfriend and Associates, acoustical engineers, has moved into new offices and laboratories located at 48 Notch Road, Little Falls, New Jersey. In its new location, the firm has expanded facilities for current research projects on sound-isolating wall design and the testing of vibration-isolation material.

Marvin R. Emerson, formerly chief engineer for Norden Data Systems Division, United Aircraft, has joined Marc Shiowitz and Associates, Inc., computer consultants, of Hawthorne, California.





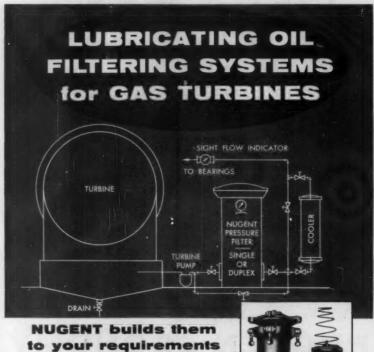
EMERSON

RANDOLPH

Charles J. Randolph, Jr. has been appointed engineering manager of the chemical division of United Engineers & Constructors Inc., of Philadelphia. Randolph comes to his new post after 18 years with the Girdler Corporation, Louisville, Kentucky.

New address of Engineers Incorporated is 20. Mt. Pleasant Avenue, Newark 4, New Jersey.

The directors of L. Frederick Pack Associates of Hawaii, Ltd., civil engineers, land planners, and photogrammetric surveyors, have approved a new organizational change as follows: Robert D. Thomas, president and general



Nugent is staffed and equipped to furnish lubricating oil filtering systems for any gas turbine . . . to your most exacting specifications.

Nugent systems filter all the lube oil in circulation every cycle, removing foreign solids 5 microns and smaller. Additives are not disturbed, yet oil is kept clean. Harmful impurities cannot reach vital parts to accelerate wear.

Whether you need a single filter or a complete system, Nugent quality products are your best buy. Contact us today for complete information.

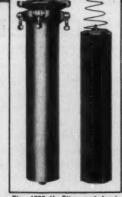


Fig. 1555-4L filter and laminated disc cartridge provide excellent micronic efficiency.



WM. W. NUGENT & GOOD DEG.

OIL FILTERS . STRAINERS . TELESCOPIC OILERS
OILING AND FILTERING SYSTEMS . OILING DEVICES
SIGHT FEED VALVES . PLOW INDICATORS



# It's packed solid with FACTS about the new and expanded line of Marlo Multi-Zone Air Conditioning Units...

This is more than just a brochure. It's a complete working handbook, with everything you need to select and order the exact unit or combination of units required to do your job most efficiently and economically.

#### MARLO coil co.

Quality Air Conditioning and Heat Transfer Equipment Since 1925

WORLD-WIDE

Mario International Ltd.
P.O. Box Vaduz 34679
Vaduz Furstentum Liechtenstein

Includes such information as:

- CONSTRUCTION DETAILS
- SPECIFICATIONS AND DIMENSIONS
- FAN AND COIL PERFORMANCE
- PHOTOGRAPHS, CHARTS, DIAGRAMS, Etc.

For Your Free Copy, See Your Marlo Representative, or Send Coupon to Us.

| MARLO COIL CO.<br>7106 S. Grand Blvd., St. Le | ouis 11, Me.                        |
|---|-------------------------------------|
| Please send me your new 64<br>Units.          | 4-page brochure on Marlo Multi-Zane |
| Name  |                                     |
| Company                                       |                                     |
| Address                                       |                                     |
| City  | Zone State                          |

manager; Meyer S. Bogost, vice president and director; Ronald F. Peart, secretary-treasurer (newlyappointed); Charles Yoon, director; and Maitland C. Dease, director (newly appointed).

William A. Summers, principal mechanical engineer, consulting, Ebasco Services Incorporated, New York, has been awarded the first Philip T. Sprague Award of the Instrument Society of America. The award was given jointly to Sum-

mers, and posthumously to J. R. Horton, of Louisiana Power and Light company, "in recognition and appreciation of their outstanding achievements in the original concept and application of digital techniques utilizing self adaptive programs for fully automatic operation of modern steam electric generating stations."

Eugene A. Bartkus has been appointed vice president, research and development, of Meissner Engineers, Inc., Chicago. Bartkus, formerly chief industrial engineer of the firm, will direct an extensive program to develop new techniques and equipment for MEI.

Karl Finsterbusch, managing director of Stone & Webster Engineering Ltd., has been elected president of the American Chamber of Commerce of London for 1961-62.

John L. Davis has been named chief engineer of Semco, Sweet and Mayers, consulting industrial engineering firm, Los Angeles.

Arthur Y. Taylor has been elected executive vice president of Jackson & Moreland, Inc., consulting engineers, of Boston. Taylor, associated with the firm since 1945, had been vice president for testing and laboratory facilities, nuclear and industrial engineering projects.





TAYLOR

GUTTMANN

Stanley Engineering Company, Muscatine, Iowa, has opened a new office in Washington, D. C. Located in the Premier Building, 1725 I Street, N.W., the office will be managed by H. Peter Guttmann.

Ralph David Barer, consulting engineer, Victoria, British Columbia, has received a \$1000 award from the American Hot Dip Galvanizers Association in cooperation with the American Zinc Institute for an idea for the substitution of forged and galvanized steel clamps for scaffold construction to retain the strength of steel, and eliminate the uncertainties of performance of lighter metals.



# SOLITROL lighting systems...offer unprecedented control flexibility

Now, for the first time, you can buy your complete lighting control system from Ward Leonard—a name made famous through years of experience in the manufacture of dimming components.

solitrol lighting systems were research developed for extreme operating versatility... in scene presetting...
... cueing... fading, and individual

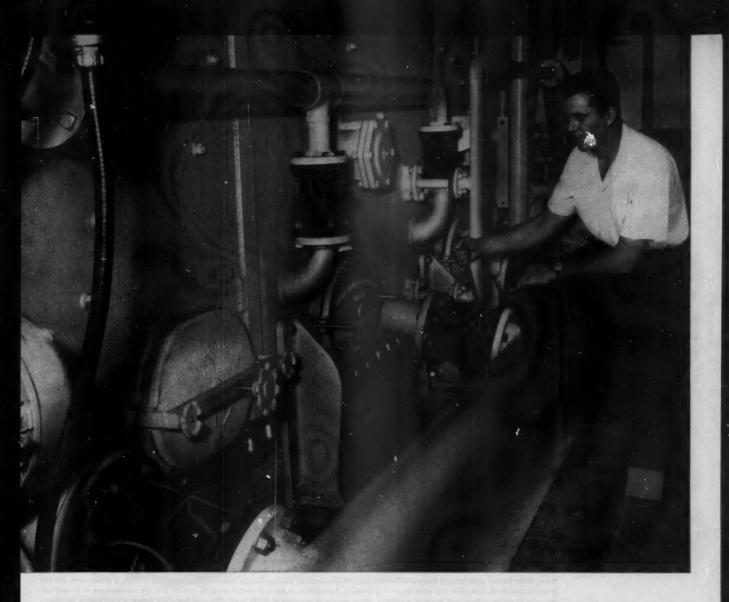
mastering. SOLITROL's functional, modular "packaging" lets you select the system complexity or simplicity you need no more, no less.

There's a SOLITROL system, utilizing silicon controlled rectifier dimmers, for every application . . . from the largest theatre or civic center, to the smallest club, church or school.

Write for descriptive literature. Ward Leonard Electric Co., 82 South Street, Mount Vernon, New York. (In Canada, Ward Leonard of Canada, Ltd., Toronto.)



WARD LEONARD
ELECTRIC CO. MILY TORK





#### BROKEN GLASS AND PAPER WON'T CLOG THIS VALVE

### | W-K-M | Non-Lubricated EC Plug Valve

Many valves were tried for the tough job of controlling the flow of a caustic washing solution that often contained bits of bottle glass and labels, but W-K-M's EC Plug Valve was the only one that could do the job successfully.

We admit this is a problem you don't run into every day, but it's a good indication of the effectiveness of the W-K-M EC Plug Valve. Whatever type of service this valve is applied to it gives a tight seal that can be adjusted on the line when wear develops. Further it excels in the handling of solid bearing liquids or gases since its elastomer coated plug resists even severe abrasive action. The W-K-M EC Plug Valve requires no regular maintenance since it is non-lubricated.

Write for specification sheet AE-1061 for full details.

WHEN SO MUCH DEPENDS ON A VALVE ... SPECIFY



W-K-M

DIVISION

**ACF INDUSTRIES** 

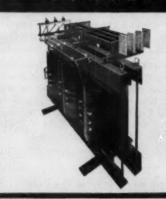
P. O. BOX 2117 HOUSTON, TEXAS



Sam H. Deane, a 75-year-old pro, pictured left above with Sorgel representative, W. Chester Smith, took out his union card in Bluefield, West Virginia in May of 1915. Sam has been an active electrician ever since. In his experienced opinion, backed up by his fellow workers and his bass, John Potter, president of Diplomat Electric, Inc., Ft. Lauderdale, Florida, Sorgel transformers like this 75 KVA, 3 phase unit, are the finest in the field. Sam says the quiet level of operation, in addition to ease of installation, is one of the big advantages of Sorgel, especially in office, school and hospital buildings. He is an active member of IBEW Local 728 and installed Sorgel Transformers for Diplomat in the newly completed Broward County Court House job, in Ft. Lauderdale.

1/4 KVA
TO
10,000 KVA,
ALL STANDARD
AND
INTERMEDIATE
VOLTAGES
UP TO
15,000
VOLTS

#### SORGEL HAS A DRY-TYPE





True quality assures you of dependability and low cost operation, and is especially important in the heart of your entire electrical system. This 500 KVA, 5 KV class is a typical Sergel core and coil unit for a unit sub-station.

Sorgel provides the most liberal designs and a coordinated system of either Class B, F, or H insulation, with the most effective use of quality materials to assure continuity of service. All units meet or exceed ASA, NEMA and AIEE standards. Shown above is a special 25 KVA Globar Furnace Transformer.

CONSULTING ENGINEER

A Case History Report ...

# A FLORIDA ELECTRICIAN WITH 45 YEARS OF EXPERIENCE PREFERS SORGEL FOR 5 REASONS

A professional of 45 years knows his electrical products and these are Mr. Sam Deane's comments on Sorgel dry-type transformers, pointing up the economy and advantages to people like yourself who buy, specify and install transformers.

Fact No. 1-"It's easy to make good tight connections in Sorgel units because the terminations are securely anchored and there is ample hand working room. Another thing, these units aren't squeezed and jammed tightly into the case, which would be dangerous and would slow down installation time."

Fact No. 2-"When we begin installing a Sorgel unit, everything is ready for wiring. Their factory assembly, wiring and testing speed up our whole installation operation."

Fact No. 3-"The case design, location of knockouts, interchangeable wall or floor mounting and the built-in lifting eyes make positioning and securing a breeze for the contractor.'

Fact No. 4-"The ventilation design is especially good as it

prevents accidental access to live terminal parts. I also like the front cover design because it's easy to remove by means of simple captive bolts."

Fact No. 5-"Last, but not least, you are really proud to have installed a Sorgel unit because of its neat appearance. It definitely is the quietest in the field, never requires maintenance."

Ask your own area electricians and see if they don't agree with this professional of 45 years' experience on the Quiet Quality features of Sorgel units. It's advantages like these that are causing more and more consulting engineers, plant engineers and contractors to specify and insist on Sorgel day in and day out.

Contact your nearest Sorgel Sales Engineer for additional reasons why Sorgel units are truly your most economical buy -as quality pays, it doesn't cost.



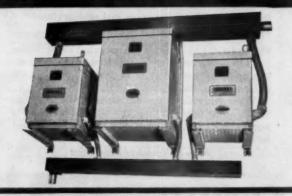
#### SORGEL ELECTRIC COMPANY

Since 1916 the pioneer in the development, manufacturing and application of sound-rated dry-type transformers

843 WEST NATIONAL AVENUE . MILWAUKEE 4, WIS.

Experienced sales engineers in principal cities

#### TRANSFORMER FOR EVERY YOUR



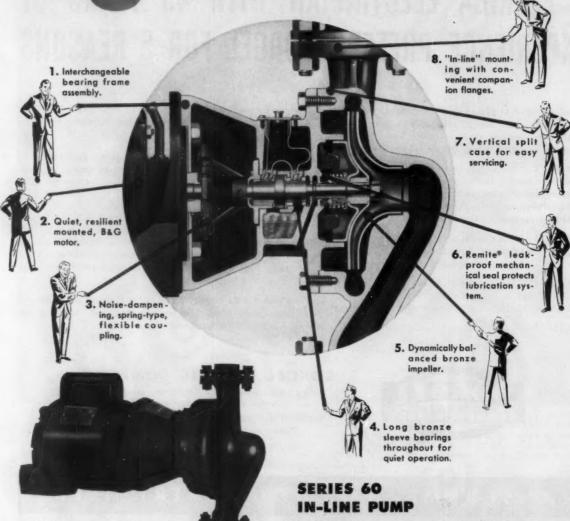
CLIP AND MAIL FOR TECHNICAL BULLETINS.

- 611-Transformer Line
- 960—Substations
- 658—DC Saturable

Reactors

Taking full advantage of Sorgei's interchangeable wall and floor mounting delign, Diplomat Electric first used the built-in lifting eyes on these Sorgel units to raise them exactly to the selected mounting position nine feet above the floor. This unique bank of one 30 KVA and two 15 KVA units took voltage from a 480Y277 volt primary and provided secondary circuits of 120/240 volt single phase and 240 volt three phase-

# WITH REASONS FOR BETTER PERFORMANCE



This new "in-line" pump has all the inherent features of B&G Booster and Universal Pumps which have been accepted as standards for quiet operation. The compact design of the Series 60 saves space...vertical split case construction and interchangeable parts permit easy servicing...in-line mounting simplifies installation.

#### AVAILABLE FROM STOCK

Series 60 Pumps are carried in factory stock as bronze fitted units in four sizes, with heads to 29 ft., capac-

Designed for air conditioning and refrigeration systems, cooling towers and general service

ities to 100 GPM, working pressures to 175 psi. When built to order, they are available as all-bronze, alliron and bronze-fitted units. Both stock and built-to-order units operate at 1750 RPM.

As presently manufactured, Series 60 Pumps from stock can be installed only in a vertical position. If horizontal mounting is required it must be so specified on order.

Write for complete information or see your wholesaler



#### BELL & GOSSETT

C O M P A N Y
Dept. GW-70, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

# The New Projects

#### St. Louis Planetarium

A graceful hyperboloid shell, supported on exterior columns, will form the enclosure for a planetarium to be located in Forest Park in St. Louis, Mo. The \$1.2 million structure will enclose a circular auditorium seating 400, and will include an interior aluminum dome upon which a projector will cast images of the constellations. The structural engineer is Albert Alper, St. Louis; structural consultants are Ketchum, Konkel & Hastings, Denver, Colo.; and the architect is Hellmuth, Obata and Kassabaum, St. Louis.

#### Los Angeles Airport Motel

A \$5 million luxury-type airport motel is being built near the Los Anglees Airport and the Marina Del Ray, in southwestern Los Angeles County. The two-story



building will occupy 158,000 sq ft, and will include complete dining, bar, and banquet space, as well as guest rooms. The balconied guest facilities will face a palm-fringed pool area. Welton Becket and Associates, Los Angeles, are the designers.

#### **Hotel Gets Central Conditioning**

Despite limited work and equipment space, and the difficulty of maintaining business-as-usual, New York's 19-story Beverly Hotel on busy Lexington Avenue was successfully converted to year-round comfort conditioning on a budget of \$750,000. The modernization



### BURNERS

On new construction . . . or in installations where owners are modernizing their heating systems, Johnson Forced Draft "package units" will produce fuel economies and freedom from service-problems seldom obtainable before. And they will deliver this high-efficiency performance regardless of stack conditions or firebox-pressure variations.

They are powered by Johnson Model 53 Burners which can be fired on Oil only, Gas only or on Combination-Oil-and-Gas, to meet your particular requirements. They are available in nine sizes ranging from 28 to 560 HP. Operation is fully automatic, All are factory assembled, wired and tested . . . which reduces installation labor and costs.

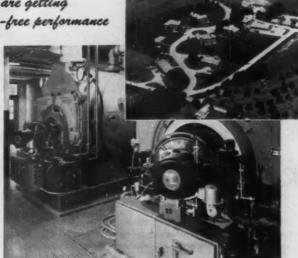
If you want the last word in modern heating equipment . . . with minimum fuel bills and less servicing cost, it will be well

worth your time to investigate the advantages Johnson Forced Draft Burner units can give you.



#### S. T. JOHNSON CO.

940 ARLINGTON AVE. CHURCH ROAD OAKLAND 8, CALIF. BRIDGEPORT, PA.



#### At the Omaha Home for Boys...

Shown above are the two 150 HP Johnson Forced Draft units recently installed in the modern new central heating plant of this outstanding 61-year-old Omaha Home for Boys. They heat all the widely separated buildings with a minimum of fuel and supervision costs. Prior to the changeover, the various buildings had been heated by six smaller Johnson Bankheat Burners which had given 16 faithful years of continuous service. The Heating Contractor on this installation was Wray M. Scott, Inc. of Omaha. The Architects were Wallace and Burrill, Inc.



#### COMPLETE LINE OF SAMPLING AND SAMPLE PROCESSING EQUIPMENT

Wet, dry and dust-tight units. Simple, reliable, automatic. Units with cutter travel to 10' and longer. New bottom-dump dry cutters (patent pending) for use where headroom is 10" or less.

Dimensioned layout drawings and specifications sent on request.

#### NEW...30"/sec. Cutter Speed

reduces bulk of material taken — often eliminates cost of secondary sampling—without affecting reliability of sample.



### DENVER EQUIPMENT

1400 17TH ST. . DENVER, COLORADO . CH 4-4466



A distinguished resort that's as popular for corporation meetings as it is with honeymooners and vacationing families! Occupying Point Clear on Mobile Bay, Grand Hotel is an internationally-

famous pleasure-land for the discriminating. Superb cuisine and luxurious comfort in the intimate club atmosphere of a 350-acre estate. 100% air conditioned. American Plan.

Home of Lakewood Golf Club, scene of All-Star Golf matches (ABC) and amoual Seniors' Tournament.

GRAND HOTEL — Point Clear, Alabama

Merray Stevenson, Vice President
Owned and operated by Southern Industries Corporation, Mobile, Ala.

program involved placing chiller units on alternate floors in 6-ft, 8-in. by 6-ft, 9in. spaces, formerly used for dining alcoves; and putting cooling tower equipment in a small exterior room on the 19th floor. Piping and fan-coils in individual rooms were installed from the bottom floors up, leaving undisturbed the upper floors which were rented, and enabling patching and redecoration to be done before the mechanical equipment was installed. The equipment, reported to be extremely compact, light and quiet, was furnished by Acme, and was specified by Cosentini Associates consulting engineers on the project.

#### **Slip-Formed Building Cores**

Several buildings under construction in Chicago, Illinois, are using slip form concreting techniques on the structural cores of the building. The Marina Towers Building, under the direction of structural engineer Frank J. Kornacker, and architect Bertrand Goldberg; and the apartment building at 5740 Sheridan Road, designed by consulting engineer J. Marion Gutnayer, both use this unusual forming technique. The



Slip-form construction, used on Marina Towers and 5740 Sheridan Road in Chicago, saves design and building time.

structures differ, since the Marina Towers complex is to have two round towers 60 floors high, and the 170-ft tall 5740 Sheridan Road project will have a square core and tower. Both projects use an imported "climbing crane," which raises itself as the work progresses.

#### **Ireland Plans Exhibit**

The Irish government has selected the New York firm of Seelye Stevenson Value & Knecht to conduct a plot



## NEW KRAMER THERMOBANK-COMPRESSOR Systems make field-fabrication as obsolete as dinosaurs and open a new era of opportunity in refrigeration.

Gone is expensive, time-consuming and inefficient field-fabrication of refrigeration systems and with it your major headaches—shortage of skilled manpower and uncertain costs! Kramer's THERMOBANK-COMPRESSOR SYSTEMS are complete systems (high side and low side), factory engineered, instrumented, assembled, tested and run-in. For outdoor installations, they arrive on the job in all-weather aluminum housings, and "Winterstated" for year-'round automatic operation.

Requiring only connection of refrigerant lines and electrical service, they permit you to handle a much greater volume of business with your present skilled staff. Gone are costly delays for components; you get a complete Kramer System with a single order eliminating reams of paperwork. Kramer's System rating assures accurate predictable performance. Costs are predictable, too, since errors in assembly or labor and material estimates are obviated.

Your customers get a better buy and a better system incorporating Kramer pioneered features including the unique THERMOBANK re-evaporative defrost with all-season Winterstat control for any size job and any temperature level.

To learn how Kramer THERMOBANK-COMPRESSOR SYSTEMS can brighten your profit picture, request Bulletin C 484A.

#### KRAMER THERMOBANK-COMPRESSOR SYSTEMS

### KRAMER TRENTON CO. Trenton 5, N. J.

48 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER



• • • Wherever workmen must go, there is a Bilco door to provide easy access. Choose from a wide range of standard units . . . or select special doors shaped and sized to your precise needs.

Ease of installation, permanent weather-sealing, and rugged construction are all part of the Bilco quality tradition. Exclusive design features include built-in spring operators for effortless lifting of even heavy plate doors. Bilco all-metal doors give you freedom of design, too—they fit and blend with any structure.

Specify Bilco doors...design with Bilco doors in mind...with confidence in Bilco lifetime quality.

See our catalog in Sweet's Architectural & Engineering Files or send for it.

|             | HORIZONTAL SPRING-OPERATED DOORS   |
|-------------|--|
| The Bilco C | o., New Haven Conn., Dept. A-8311<br>ne your new catalog on special service door |
| NAME        | ne your new culding on special service door                                      |
|             | ne your new carding on special service door                                      |
| NAME        | ne your new calance on special service door                                      |

survey, and the general design studies, for Ireland's exhibit at the 1964-65 New York World's Fair. The firm of Cushing and Neville will consult on the industrial design application of the site.

#### **Scottish Two-Way Power Station**

The Cruachan pumped storage station of the North of Scotland Hydro-Electric Board's Loch Awe scheme will utilize four single-stage pump-turbine 100,000-kw motor-generator sets. The 400,000-kw power station will be situated deep in Ben Cruachan (mountain) below the level of Loch Awe, and 1200-ft below the storage reservoir. During peak demand periods water will be fed from the reservoir through a 3500-ft long tunnel to the machine room of the generator station. During periods of low demand, the reversible generator-motors use cheaper power to pump water back to the reservoir for peaking storage. Merz and Mc-Lellan, electrical and mechanical engineers, London, England, and the civil engineering firm of James Williamson and Partners, Glasgow, Scotland, are the consulting engineers on the project.

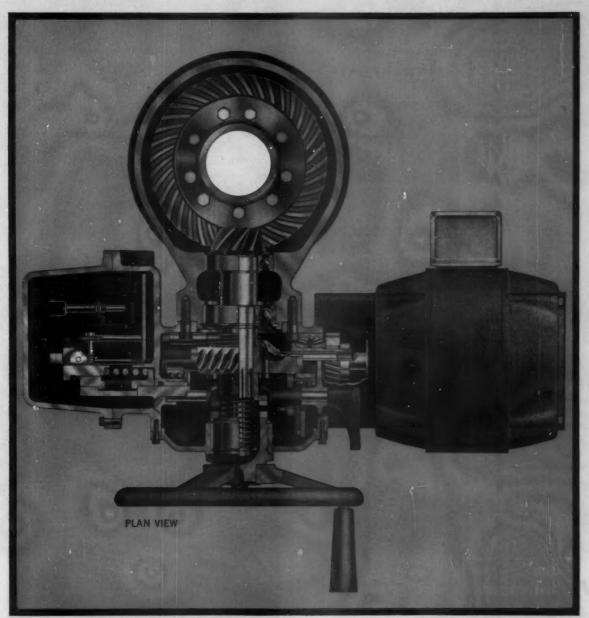
#### **Planning Flexible Government Buildings**

The building housing the New Jersey State Department of Labor and Industry, Trenton, N. J., utilizes steel building framing, cellular steel deck, and mov-



The New Jersey Department of Labor and Industry Building in Trenton will house offices scattered about the city.

able interior partitions to provide flexibility to accommodate future space and use requirements. According to the structural designer, Nicholas Farkas, of Farkas and Barron, structural engineers, N. Y., public buildings must be designed to be flexible. If not, they will become increasingly inefficient with changes in government departmental functions and subsequent space use. Unlike renters of commercial office facilities, government



## Now-"Crane Teledyne" motor operator for valves

#### ft's new and only from Crane!

Today Crane is the only full line valve manufacturer that offers its own motor operator; this simplifies and speeds up your ordering and installation. And you get undivided responsibility for performance from one manufacturer.

"Crane Teledyne" was designed to provide torque only (thrust is taken on valve parts). This feature results in lower cost, smaller size and less weight than other operators with comparable output ratings.

We specifically designed "Crane Teledyne" for a wide variety of Crane valves.

You can order it in two ways: as a conversion kit to motorize present valves in minutes; or fully motorized Crane valves straight from stock.

The motor operator is equipped to act as a gear-operated valve (4:1 ratio) in cases of electrical emergencies. Available we push-button control or can be programmed for automated operation.

For full information, call your Crane distributor. Or write Crane Co., industrial Products Group, Dept. U, 4100 So. Kedzie Ave., Chicago 32, III. In Canada: Crane Ltd., 1170 Beaver Hail Square, Montreal, Que.

AT THE HEART OF HOME AND INDUSTRY



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ernment departments cannot easily change quarters when their public-owned facilities become inadequate.

In anticipation of departmental growth of the New Jersey State Department of Labor and Industry, raceway cells for power and communications are placed on 6-in. centers for maximum desk planning flexibility; durable movable steel partitions, easily relocated, are used throughout; and lightweight concrete decking, topping, and firepoofing save structural weight and reduce building costs. Due to possible flooding conditions, mechanical equipment is located on the first floor level and in penthouse quarters. The \$11.5 million, 13-story building was designed by architect Frank Grand and Sons, Newark, N. J., and the mechanical engineer is Theodore J. Kauffeld.

#### **Hawaiian Apartment Project**

Ilikai, Inc., a \$23 million community living facility, is a 27 story, 1056 unit structure, designed on a Y-shaped configuration. The unit will face Ala Moana Yacht Harbor and offer such facilities as a marina, Olympic-sized pool, ground level shopping mall, professional offices, and extensive indoor-outdoor dining facilities. The basic structure, of prestressed concrete



Ilikai, Incorporated, a \$23 million apartment project to be built in Honolulu. It will include 1056 dwelling units.

components, will take 18 months to build. It is the largest building of this type ever built, and the first Hawaiian housing facility to be built on fee-simple land. John Graham and Company, Seattle, is the consultant.

#### Thin Shell Church Roof

A combination of thin shell roof structure and exposed prestressed concrete columns lends traditional



#### Fairbanks-Morse O-P Diesels keep emergency lines open!

When commercial electric power is suddenly cut off, emergency generating equipment becomes the most important single investment ever made by an institution or business.

With the F-M 38F51/4 Opposed-Piston Diesel Generating Unit, only 15 seconds lapse between loss of commercial power and new, F-M generated power . . . 15 seconds for the 38F51/4 to come to full power from a cold start.

Experience has taught telephone companies to use F-M Diesel Generating Equipment to handle emergencies. It goes to work instantly maintaining automatic dialing and toll lines. Hospitals, institutions, factories, hotels and schools also need this vital protection. And F-M diesels are backed up by the reputation of the leader in the field. For full details on Model 38F5¼, or any other manually or automatically controlled unit, write: S. K. Howard; Director of Marketing; Beloit Division; Fairbanks, Morse & Co.; Beloit, Wisconsin.



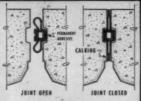


MODEL 38F51/4 OPPOSED-PISTON DIESEL GENERATING UNIT Delivers more kw at less cost, in less time . . . in less space than any other unit. Opposed-Piston design minimizes vibration, produces fine balance . . . smooth power and instant response. 40% fewer moving parts than comparable engines of equal horsepower mean reduced maintenance . . fuel and lube oil savings. Range from 170-616 kw.

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Williams Panel Seals (Pats. Pend.) were developed especially for use in vertical and horizontal joints of precast concrete wall panels . . . they are extrusions of expanded, closed-cell Meoprene Rubber. This closed-cell material, and the hollow-core design, provide the properties which assure a positive pressure-contact seal in panel joints under all conditions—each type of seal readily compensates for variations in joint width, irregular joint surfaces and erection adjustments.



VERTICAL JOINT

3" Joint in Sculptured Procest Concrete Panel with Quartz Aggregate Foce WILLIAMS "DOUBLE-WING" SEAL No. 1A

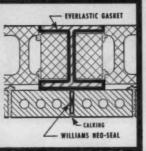
#### PERFECT-SEAL for CONTROL JOINTS



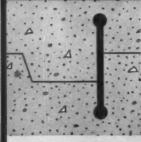
Williams "Perfect-Seal" (Pat. Pend.) is a specially designed seal for use in Mortar-Keyed Control Joints...if provides continuous four-point pressure-contact sealing which keeps moisture out of joints and prevents air passage. The T-Section is a high-grade rubber compound; the cross-sealing member at the base of the "T" is a strip of readily compressible, non-absorbent, expanded closed-cell Neoprene Rubber—it provides an effective pressure-contact seal directly behind the calking.

#### EVERLASTIC MASONRY GASKETS

Everlastic Masonry Gaskets are a readily compressible, nonabsorbent Elastomer which is impervious to water and inert to heat, cold and acids. In masonry joints, they permit linear expansion, and seal the joints against moisture penetration which causes frost damage. Everlastic Gaskets should be used between sill and coping stones, stone or prefab metal wall panels, and to isolate and cushion all steel or concrete columns to permit normal movement without damage to mosonry walls.



#### RUBBER or VINYL WATERSTOPS

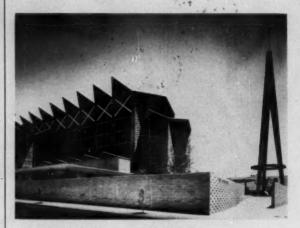


Williams Waterstops are made from Natural Rubber Stock and designed for maximum effectiveness in any type of cast-in-place construction joint. They will bend around corners, and will not crack or tear from shear action. Tensile Test: 3990 lbs., Elongation Test: 650%. Available in rolls up to 80 feet in length. Molded union and junction fittings available. Williams Waterstops can be furnished in Vinyl or Neoprene for industrial uses where resistance to oil or other injurious wastes is desirable.

See Sweet's Files, or Write for Information.

WILLIAMS SEALS and GASKETS DIVISION
WILLIAMS

EQUIPMENT and SUPPLY CO., INC. 486 W. Eight Mile Rd., Hazel Park, Michigan symbolism to the functional design of the First Methodist Church, Glendale, California. The three-inch thick hyperbolic paraboloid roof deck sections perch 68-ft up on slender concrete columns, and the deck



Prestressed concrete, aluminum, and glass unites traditional and contemporary concepts in Glendale Methodist Church.

spans 59-ft between columns. Acoustical treatment and MoSai exposed aggregate were applied pneumatically to walls. Flewelling and Moody, Architects and Engineers, Los Angeles, did the design.

#### **Commuter Train Rerouting**

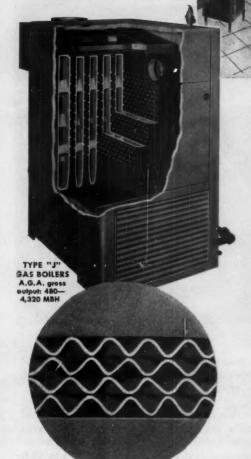
The physical and economic feasibility of rerouting Jersey Central Lines commuter trains into the Pennsylvania Railroad Station, Newark, N. J. is currently under study. The New York consulting engineering firm of Ford, Bacon and Davis, Inc., is studying the feasibility of this scheme, which would allow New Jersey commuters to reach Manhattan via Hudson Tubes or Pennsylvania Railroad commuter trains.

#### 200-Bed Medical Facility

Preliminary design has been approved by the Air Force for a 200-bed composite medical facility for March Air Force Base, California. The five story, 130,900 sq ft building, estimated to cost \$3.7 million, will have a four-story tower resting on a one-story, T-shaped base. The building will have outrigger columns, which will free the exterior walls of structural elements and allow flexible interior space arrangement. An additional \$226,800 is to be spent for boiler plant and outside facilities. Welton Becket and Associates, Los Angeles is the engineer-architect.

#### **Record Housing Project**

Rochdale Village, being built on the site of the Jamaica Race Track, New York, represents the largest single concrete construction contract let for a hous-



#### QUIET RIBBON BURNERS

Herringbone stainless steel ribbon burners are flexible over a wide range of gases, facilitating dual-fuel operation. This flexibility is also an important consideration where a switch to natural gas from other gases is expected in the future.

The sections of any Weil-McLain Oil or Gas Boiler, regardless of size, can be passed through an ordinary door.



### QUIET

A favorite for school installation

The Weil-McLain Type "J" Gas Boiler is a valuable aid in conserving space...not only because of compact design but because amazingly quiet operation permits a wide choice of boiler room location.

The ribbon burners used on Type "J" boilers are designed for quieter operation, assuring noiseless ignition and flame extinction. A new flame carry-over principle provides quick and silent light-off with a minimum number of standing pilots. A gas valve with a slow opening feature is furnished as standard equipment and further contributes to quiet operation.

The "J" Boiler has no motors or fans which in other types of boilers are sources of noise and demand heavy use of electricity! It does not need a high chimney which conflicts with modern architecture...products of combustion can be expelled with only a five foot vent riser beyond the draft hood openings.

These boilers are A.G.A. approved and I=B=R rated. They are available in 33 sizes, increasing in increments of only 500 gross sq. ft. For full information write for Bulletin C-297 or see Sweet's Architectural File or Engineer's Product File.

#### BOILERS FOR OTHER FUELS

Weil-McLain Boilers for commercial, industrial and institutional installations are available for gas, oil, heavy oil, combination gas-light oil, or coal. For full information, write Weil-McLain Company, Michigan City, Indiana, or see Engineer's Product File or Sweet's Architectural File.

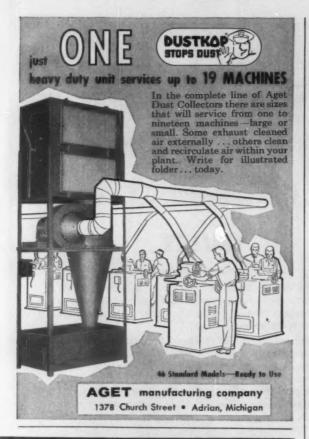
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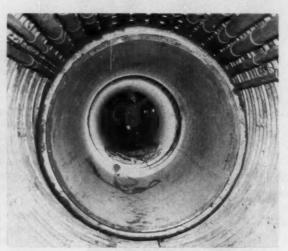
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YOUR HEADQUARTERS FOR BUSINESS AND PLEASURE

ing project. The project's 20 residential buildings will contain 5860 apartments, and house about 20,000 persons. The apartment, shopping center, garden, playground, and parking facilities will require 200,000 cu yds of concrete and 16,000 tons of reinforcing steel. A concrete mixing plant will be located on the building site. The consulting engineering firm of Farkas and Barron, New York; and Herman J. Jessor, architect, designed the project.

#### **Industrial Water Supply**

An unusual water supply problem of the Detroit Steel Corp., New Boston, Ohio, was solved by running a water tunnel from the center of the Ohio River chan-



An inside view of the 207-ft. long, 96-in. diameter tunnel which carries 129 mgd from the Ohjo to Detroit Steel.

nel, beneath a flood wall and eight mainline railroad tracks, to the plant. The system, designed by consulting engineer Alden E. Stilson, has two 48-in. intake pipes in the river bed, feeding water to a 24-ft by 92-ft round concrete caisson on the bank. A main 66-in. feeder, encased in a 96-in steel tube leading to the plant, begins at the caisson. The \$1.25 million project delivers 129 mgd to the company's mill.

#### **Engineering Marine Salvage**

Meissner Engineers, Inc., Chicago, are perfecting plans for the salvage of the vessel, Prins Willem V, which sank off Milwaukee in Lake Michigan seven years ago. The vessel, resting on hard clay in about 85-ft of water, has resisted previous attempts to raise it. However, Meissner hopes to succeed with between 100 and 120 neoprene coated nylon bags that, when inflated, will lift ten to fifteen tons apiece. Careful balancing should bring the ship back up to the surface with its deck floating clear.



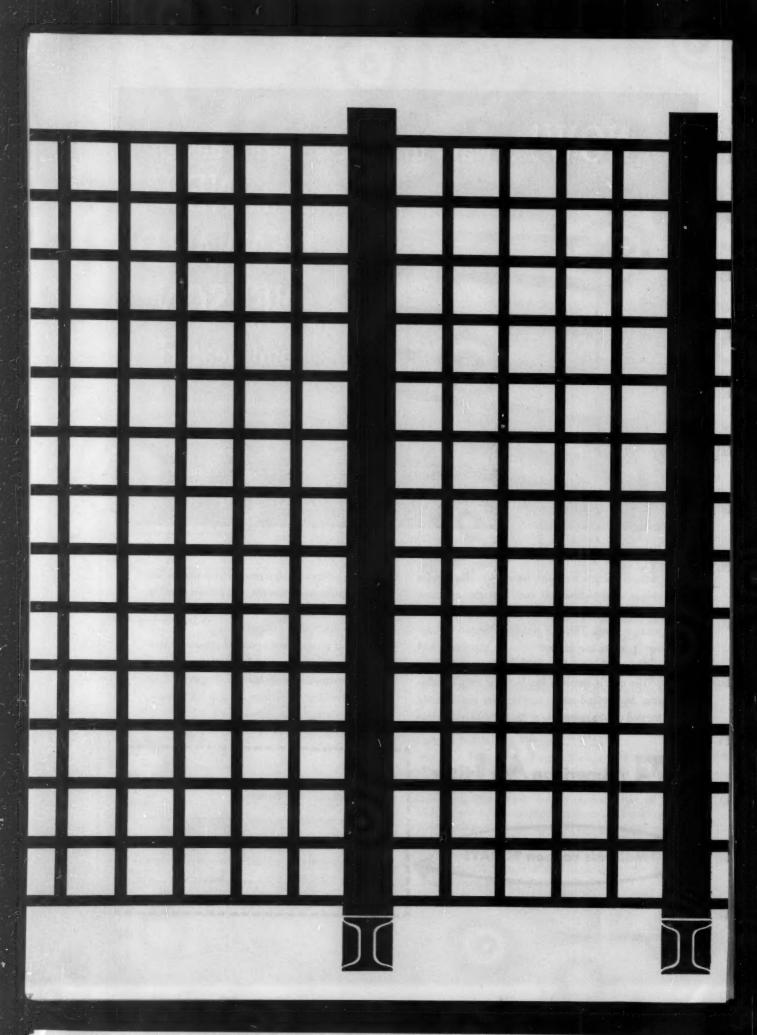
This is the new Kennard/Nelson Unit Heater. Its unique double-duty coil combines the optimum heat transfer requirements for both steam and hot water systems. The new Kennard/Nelson coil design permits the highest possible capacities and widest ranges available with either heating medium.

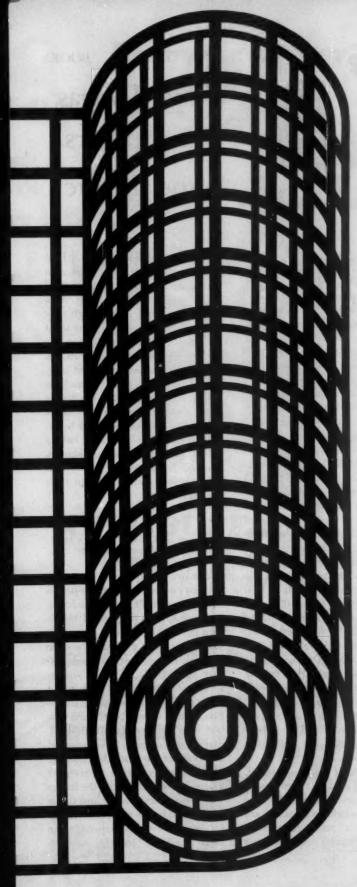
The unit is specially designed for easy installation. Supply and return tappings are conveniently located on the same side of the unit. This arrangement cuts piping and labor costs, makes snug ceiling and wall mountings possible, and gives a pleasing, uncluttered appearance. Compact cabinet design also provides more headroom.

Clip and return the coupon for complete information on the new Kennard/Nelson Unit Heater with its double-duty coil. Mail to: Engineered Air Systems Division, American Air Filter Company, Inc., 300 Central Ave., Louisville 8, Ky.

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All concrete fills or slabs on grade should be reinforced with Welded Wire Fabric because it increases the strength of a plain concrete slab 30%. The cost of the fabric reinforcement slab is therefore much less than an unreinforced slab of equal strength. • For a complete look at the cost and design advantages of USS American Welded Wire Fabric, call or write American Steel and Wire, Dept. 1407, Rockefeller Building, Cleveland 13, Ohio. We will gladly assist you on any concrete reinforcing problem.

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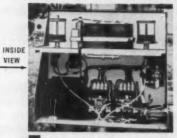
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## The Tongas, Computers, and Music

The Shadow of the Dam, by David Howarth; The Macmillan Company, New York, N.Y.; \$4.00.

When Livingstone first traveled down the Zambesi River in 1855, he discovered a tribe known as the Tongas. They inhabited the Gwembe Valley, stretching almost 100 miles southwest of the present site of the Kariba Dam. The Tongas had no history before Livingstone came, and they had very little after — until the decision was made to build the Kariba Dam.

When David Howarth went to Africa in 1959, he intended to write about the Kariba Dam. Once on the site, however, he became more interested in the wilderness than in the dam. Though he learned about the effects of the environment on the building of the dam, he did not really feel that he knew too much about the effects of the dam on its environment. So in 1960 he went back, not to the dam, but to the valley of the Zambesi where the flood which the dam had caused was still rising. Here he heard "the story of the 50,000 primitive people called Tonga who lived in the valley before the dam was built, and of what happened when they were told that the flow of the river was going to stop, and their land was going to disappear below the water of a lake."

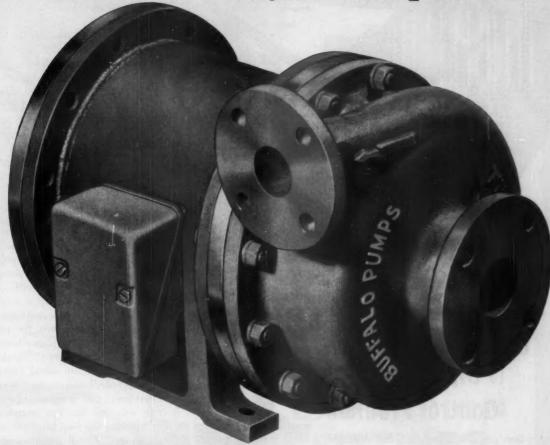
The Shadow of the Dam is, then, a sociological study. It analyzes in great detail what happens when the trappings of industrialization are thrust upon a primitive society. Whatever the reader may feel about

British colonialism, he cannot help but be sympathetic with the men in the colonial service. They tried to handle a nasty business in a humane manner, and, though they failed in part, it was not for want of patience with and understanding for the stubborn Tonga evacuees. Much was written about the tragedy of drowning a few animals as the waters rose behind Kariba. Is it any less important that we know about the events which led up to the use of tear gas and bullets against primitive spears and shields, wielded by a people which had never before gone to war in their known history?

Computers and Common Sense, by Mortimer Taube; Columbia University Press, New York City; \$3.75.

For many years, one of the more popular themes in science-fiction has been a revolt of the machines, in which man is subjugated by his own inventions. While it seems unlikely that man ever will be able to devise a machine capable of plotting against him, it is not unreasonable to assume that man could come to rely too much upon invention, as if it were a beneficient despot or a first sergeant. Indeed, maybe we already have reached that point of too much dependence.

Nevertheless, cries Mortimer Taube, there is a limit to the things which machines can do, and therefore a limit to the number of things for which we can depend upon them. And the trouble, he conHermetic...they're Leakproof!



**NEW 'BUFFALO'** 

# GAN-O-MATIG\* PUMPS with self-adjusting bearings

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Long-life bearings represent a great new advance in canned pump design. Lubricated by the liquid being pumped, they absorb both radial and axial thrusts...automatically compensate for bearing and journal wear. Toxic or volatile, liquids cannot escape...air cannot leak in.

Thirteen sizes with 1" to 5" discharges are now available for a wide range of applications. Standard units with stainless steel rotor cans are designed for 120 psig and 40° through 250° F. operations. Special models are available for higher pressures and temperatures, and a variety of dangerous corrosive liquids.

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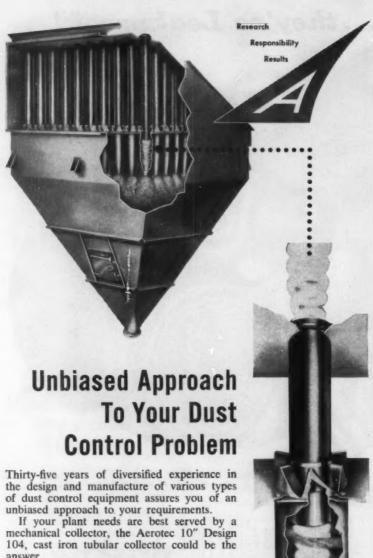
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This collector consists of multiple high efficiency tubes. Gas is essentially introduced tangentially through airfoil ramps with both vertical and horizontal component forces. The tubular elements were developed specifically to produce smooth gas flow for higher efficiency. Tubes are easily washed down where sticky material is handled, and the unique assembly of removable tubes simplifies replacement if excessive abrasion should occur.

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tinues, is that many of us do not realize the existence, or extent, of this limitation. Taube begins and ends his book

with the observation that every one of man's intellectual pursuits - except science - is exposed and subjected to the challenges, complaints, and corrections of informed critics: there are many men - who never have composed a poem, painted a picture, or played a sonata - who are nonetheless competent to point out the inadequacies of those who do compose, paint, or play. Why then should not scientific study and research be exposed to the same sort of criticism? The answer to this, says the author, is that the scientists, and the private and public groups which supply their monies, have equated criticism with censorship. And censorship is one of the major bugaboos of our times.

As the title indicates, the chief topic for dissection in this book is the role of computers - "thinking machines" - in our world. We are told repeatedly, in news releases, interviews, and magazine articles, that someone has just completed, or is taking the final bugs out of, a machine that will instantaneously translate Russian into English, or any given language A into any given language B. But no one has come up with a creditable machine translation of anything yet. The only mechanical translators devised so far require one trained operator to "prepare" the original text for the machine, and another trained operator to "interpret" the machine's results in terms of the second language. And so far, no one has found a way to overcome to sort of problem encountered in handling a word, such as "pen," which may have two distinct meanings: machine translators are unable to distinguish between the statements, "The box is in the pen," and "The pen is in the box."

The author may be wrong in dismissing research into the methods of mechanical translation, but he certainly is right in his demands for



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a body of informed, constructive scientific criticism.

Science and Music, by Sir James Jeans; Cambridge, New York City; \$1.95.

This is the first paper-back edition of one of the classic books about music. First published in 1937, Science and Music is a brilliant and engrossing explanation of the scientific basis of music.

The book explores every facet of music: the anatomy and functioning of the human ear; the physical nature of sound vibrations; the types and composition of various musical instruments; and the problems of acoustical design.

Although Jeans' approach is purely scientific, no particular background is required to follow his explanations, except an interest in music. This is one of those books

that we will leave on the eye-level shelf of the bookcase, hoping that guests (and offspring) will want to read part or all of it.

#### **New Technical Books**

OPERATIONAL ELECTRICITY, by Charles I. Hubert, John Wiley & Sons, Inc., New York; \$8.50. Although this book is written for students with only high school physics and trigonometry backgrounds, they should be excellent students. Hubert deviates from the traditional separate treatment of ac and dc current, and treats dc as a special condition of ac. The book is well illustrated with drawings, photos, and charts.

HYDRAULIC DATA FOR FIRE PROTEC-TION SYSTEMS, by C. Wood; Automatic Sprinkler Corp. of America, Youngstown, Ohio; \$10.00. Not a broad treatise on hydraulics, this book (in binder form) was developed to facilitate the accurate design and detailing of automatic and manual fire protection methods commonly incorporated into modern buildings. Deluge, spray, automatic sprinkler, and hose systems are presented in detailed form with formulae, charts, and details pertinent to design which meets present building codes.

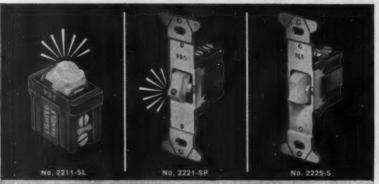
Handbook of Transistor Circuit Design, by Keats A. Pullen, Jr.; Prentice-Hall Book Co., Inc., Englewood Cliffs, N. J.; \$13.00. This book employs coordinated static and small signal design procedures in the scrutiny of the reliability of transistors and other active devices. The number of significant design parameters is reduced by the use of a two-part analysis of parameters and modifications required to attain optimum representation.

RADIATION CHEMISTRY by S. Lind; Reinhold Publishing Corp., New York; \$12.50. This volume is a revi-

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Pinpoints switch location in darkened rooms or hallways. Tiny, long - life neon lamp softly glows in OFF position only. Single pole or three-way. Rating: 15 Amperes, 120 Volts, A.C.

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sion and extensive enlargement of Monograph Number 2 of the American Chemical Society, entitled "Chemical Effects of Alpha Particles and Electrons." It includes descriptions of all experimental work pertaining to ionizing radiation as it is used to affect chemical reactions, particularly in gases.

INFRARED ABSORPTION OF INORGANIC SUBSTANCES, by Lawson; Reinhold Publishing Corp., New York; \$6.75. This book compiles and reviews pertinent information on the infrared absorption of inorganic substances. About half the work is devoted to currently used experimental techniques (and controlling factors), while the other portion is a complete glossary and annotated bibliography with index.

DESIGN OF SMALL DC MOTORS, by A. F. Puchstein; John Wiley and Sons, Inc., New York; \$12.50. Essentially a collection of methods for designing small direct current electrical motors, this volume covers design conditions where stock parts are available for motors and where motors must be designed on a "custom" basis. The author is thorough and orderly in his presentation, and emphasis is placed on electromagnetic aspects of design, both theoretical and practical.

SEMICONDUTOR DEVICES AND THEIR APPLICATIONS, by Richard E. Greiner; McGraw-Hill Book Co., Inc., New York; \$12.50. This text emphasizes that the engineer must understand the operation as well as the application of electron devices used in communications, control, and other circuitry. A thorough treatment of transistor operation in small and large circuits, and of switching effects, is included.

RADIOACTIVE WASTES: TREATMENT AND DISPOSAL by J. Collins; John Wiley and Sons, Inc., New York; \$8.00. The book is timely, and is directed to engineers interested in the fields of municipal and industrial waste disposal or water supply. Its 10 chapters, covering most of the aspects of source, control, and disposal of radioactive materials, are written by eight of the leading British experts in this field. The subject is covered in a most readable manner and reflects the practical British mind.

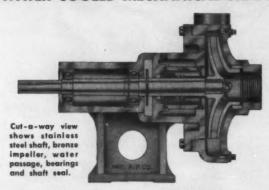
TABLES FOR ULTIMATE STRENGTH DESIGN OF REINFORCED CONCRETE BEAMS, JOISTS & SLABS, by Cunningham, Keister, Newett, and Phillips; Murphy Printing, Jacksonville, Florida. Write CKNP Tables, P.O. Box 16434, Jacksonville, Florida for information. Presented in design handbook style, this handbook presents formulae and design tables to enable the engineer to utilize the ultimate strength principle of concrete design, and thus save 10 to 20 percent in reinforcement over conventional elastic theory design methods. Ultimate strength theory is explained and tables enable the designer to utilize theory without involved computations. Design of lightweight concrete structures is also included.

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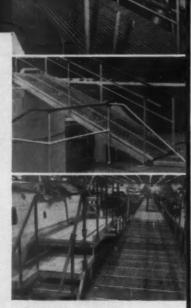
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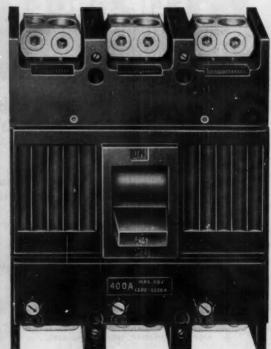
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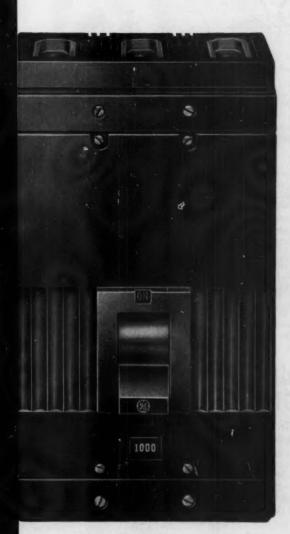
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# FLUIDICS SPOKEN HERE Water treatment news for the consulting engineer

#### "Salt Splitters"

Now...A Third Method Of Silica Removal

By Lyle Arnold, Product Manager, Water Softening Section, The Permutit Company



SILICA (SiO<sub>2</sub>) has long been a serious problem in boiler plants. First, it tends to form a hard, glassy scale on internal boiler surfaces. Second, at higher pressures, it volatilizes and goes over with the steam to re-condense in the lower stages of turbines. Here again it solidifies in a hard, glassy scale that requires frequent and costly turbine shut-downs to remove it.

Until recently, only two methods were available for removal of silica from boiler makeup water:

Demineralization, which removes virtually all dissolved solids, including silica.
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2. Hot process, which is specified where very large quantities of water are required.

"Sait Splitters": a third and relatively new process, for the reduction of silica to an acceptably low level (less than 1.0 ppm), while offering certain competitive economies. It utilizes caustic regenerated anion exchangers, which absorb chloride, sulfate and bicarbonate ions of the sodium salts and replace them with hydrate ions, while at the same time absorbing silica. This treatment is most economical when applied to waters of low solids content. The effluent produced contains less than 1 ppm each of chlorides and sulfates. Alkalinity is mostly hydrate. Total anion content is essentially unchanged.

A typical installation in a New England paper mill operates on river water containing 10 to 15 ppm of electrolytes, 9 ppm of silica and 2 ppm of  $\mathrm{CO}_3$ . Silica in the effluent was guaranteed not to exceed 0.8 ppm with a rating of 7 kgr. per cu. ft. of resin. Field tests show 1 ppm of silica at a capacity of 12 kgr. per cu. ft. and 0.2 ppm of silica after 5 kgr. per cu. ft.

If you'd like to know more about "salt splitters" or any other aspect of water treatment, write to Permutit Division, Dept. CE-111, 50 West 44th Street, New York 36, New York. In Canada, contact Permutit Company of Canada, Toronto.



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# Consulting Engineers' Calendar

Nov. 2-4. Consulting Engineers Council; Semiannual Meeting, Golden Gate Hotel, Miami Beach, Florida.

Nov. 6-9. Atomfair-61, in conjunction with annual meetings of American Nuclear Society and Atomic Industrial Forum, Conrad Hilton Hotel, Chicago, Illinois.

Nov. 10. Association of Consulting Chemists and Chemical Engineers, Inc., in cooperation with Pittsburgh Chapter, American Institute of Chemists; Symposium, "The Use of Technical Experts in Legal Problems," Pittsburgh-Hilton Hotel, Pittsburgh, Pennsylvania.

Nov. 13-17. American Public Health Association; 89th Annual Meeting, Cobo Hall, Detroit, Michigan.

Nov. 26-Dec. 1. American Society of Mechanical Engineers; Winter Annual Meeting, Statler Hilton, New York, New York.

Nov. 27-Dec. 1. 28th Exposition of Chemical Industries, New York Coliseum, New York, New York.

Nov. 28-30. Building Research Institute; Fall Conference, Mayflower Hotel, Washington, D. C.

Nov. 29-30. University of Michigan, College of Engineering, "Effective Utilization of Engineering Personnel," Kellogg Center, East Lansing, Michigan.

Nov. 29-30. Oklahoma State University; Industrial Wastes Conference, Campus, Stillwater, Oklahoma.

Dec. 3-6. American Institute of Chemical Engineers; General Meeting, New Yorker Hotel, New York, N. Y.

Dec. 6. American Institute of Consulting Engineers; Luncheon Meeting, Engineers' Club, New York City.

Jan. 8-12. Highway Research Board, National Academy of Sciences, National Research Council; Annual Meeting, Sheraton-Park Hotel, Washington, D. C.

Jan. 15. American Institute of Consulting Engineers; Annual Meeting, Engineers' Club, New York, N. Y.

Jan. 22-Feb. 1. University of California Extension; Short Course on "Engineering and Management," Campus, UCLA, Los Angeles, Cal.

Jan. 25-27. National Society of Professional Engineers; Annual Winter Meeting, King Edward Hotel, Jackson, Mississippi.

Jan. 29-31. American Society of Heating, Refrigerating, and Air Conditioning Engineers; Meeting, Chase-Park Plaza, St. Louis, Missouri.

Feb. 12-15. Air-Conditioning and Refrigeration Institute, 12th National Exposition, Great Western Exhibit Center, Los Angeles, California.

Feb. 18-22. American Institute of Mining, Metallurgical, and Petroleum Engineers; Annual Meeting, New York.

Feb. 19-23. American Society of Civil Engineers; Convention, Hotel Shamrock, Houston, Texas.

March 11-17. American Society of Photogrammetry; Annual Convention, Brown Palace, Denver, Colorado.

March 12-15. American Concrete Institute; 58th Annual Convention, Brown Palace Hotel, Denver, Col.



# 680 tons of Chrysler Air Conditioning on the roof save 1100 sq. ft. of valuable floor space inside Sprouting from is no fixed operating cost, as

Sprouting from the roof of this new plant for Ross Gear and Tool Company are 22 Chrysler 30-ton packaged air conditioning units. Together with two Chrysler packaged liquid chillers and four split-system units, they provide the cooling (785 tons of it!) for almost five acres of manufacturing and office space.

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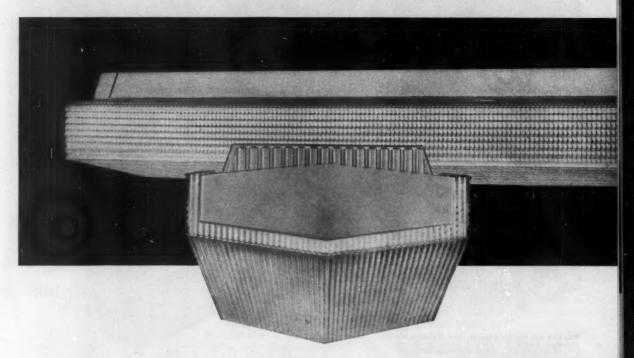
Whether your job calls for air-cooled or water-cooled equipment... packaged units or chillers... you'll find the complete Chrysler line has the exact unit you need. For complete data, or the technical cooperation of a Chrysler Engineer, write today.



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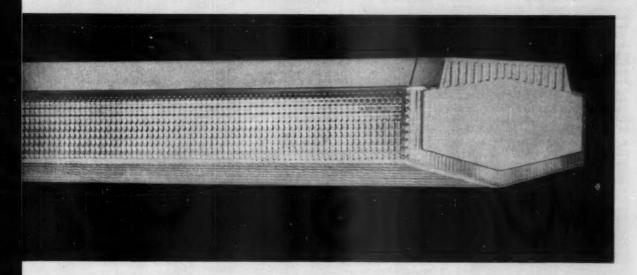
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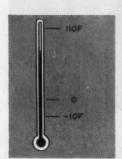
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#### 6 tips to help save money on cable installations



#### 1. Avoid extreme temperatures

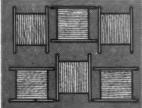
-below 10F and above 110F (unless cable is specifically designed for this purpose). Low temperatures are seldom harmful to cable, but when they are combined with impact, flexing or other mechanical action, it's possible that the cable may be damaged by cracking, flaking or complete rupture of the coverings. Excessively high temperature, all by itself, can materially shorten the

potential service life of stored cable. Thermoplastic components may soften and flow; rubber and many other materials undergo chemical and physical changes at high temperatures. You can avoid this problem by not storing cable near heating units, steam pipes, etc.

2. Avoid mechanical impact and crushing. Wire on a reel can be rendered useless by allowing the flange of another reel to crash against it. Arranging the stored reels in a crosshatch pattern is



the simplest way to avoid this kind of accident. If space is at a premium, the reels may be stored in trays that allow only the flanges of adjacent reels to con-





3. Use the oldest stocks first. Very few materials improve with age, so the sooner you use stored cable the longer it will last in service. Also, the less time a cable



spends in storage, the less chance there is for damage. Keep rotating stocks so that the newest cable goes to the end of the line.

#### 4. Swab conduit before pulling wire

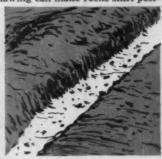
A remarkable amount of abrasive material-nails, glass and such-can accumulate in conduit, pipe or duct before the wire is pulled through. And pulling a wire or cable through such litter could damage it severely. If you pull a swab through the conduit ahead of the wire to clear the way, you'll eliminate a big source of hidden installation damage.



#### 5. "Direct burial" doesn't mean "on top of anything"

The specification "direct burial" on a cable doesn't mean that you can afford to bury the cable directly on top of whatever you might find in the earth. Trenches should be cleared of rocks and broken glass before the cable is buried. Freezing and thawing can make rocks shift posi-

tion, and, possibly, exert enough pressure on the cable to cause premature failure. The same danger exists when wires that cross underground rest on each other. Moral: clear trenches before burying cable, bed the cable in sand, and keep crossed cables separated.



#### **b.** Pick the strongest component when pulling cable

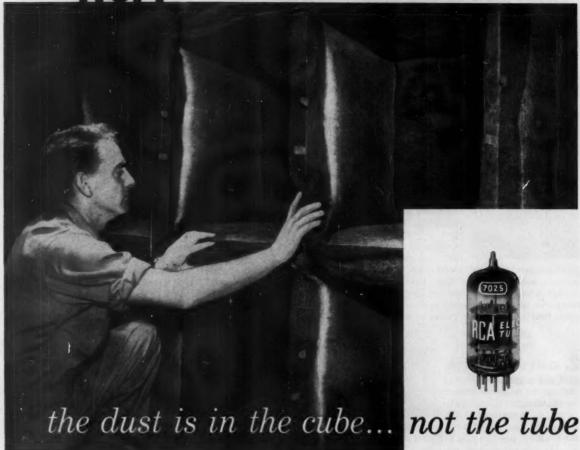
When wire or cable is being pulled-in, either through conduit or aerially on poles, it's essential to put all the pulling tension on the strongest part of the cable assembly. Ordinary single-conductor material should have pulling tension applied to the bare conductor. Applying tension to the covering materials tends to stretch them, and can lead to breaks in some cases. Always pull preassembled aerial cables by the messenger, not by the insulated conductors. Interlocked-armor cable should never be pulled by the armor, since this may cause severe damage by unlocking the armor.

This collection of ideas comes from many years of probing into wire and cable problems-and solving them. It's likely that we've come across some problems just like yours, and together we could probably work out a fine solution. So, please give us a call, or write, Anaconda Wire and Cable Company, 25 Broadway, New York 4, New York. Department EFL-1-CE.

ASK THE MAN FROM

FOR TECHNICAL ASSISTANCE ON WIRE AND CABLE PROBLEMS

at RCA



Air clean enough to breathe could contaminate a miniature vacuum tube. For maximum filtering efficiency a pre-filter precedes an electrostatic precipitator at RCA's electron tube plant in Harrison, N. J. Recently, an increased heat load required an increase in the velocity of air—from 600 ft. to 800 ft. per minute—to pass through the pre-filter. This meant changing filters every two weeks. RCA required greater filtering efficiency and longer filter life without a major overhaul of the system, and Union Carring had the answer!

UNION CARRIDE'S new ULOK Cube Filter provides .06 WG resistance (clean) and four months freedom from maintenance before the .5 WG resistance requiring a filter change is reached. Furthermore, since this new filter stops particles as small as 3 microns, there is a noticeable reduction of particulate matter on the ionizing wires of the electrostatic precipitator.

ULOK Cube Type Air Filters are delivering similar performance in major installations everywhere. Fashioned of DYNKI. modacrylic fiber—a dry unoiled medium which may be vacuum cleaned—these unique filters are unexcelled for stopping and holding unusually large quantities of dust, dirt, and foreign matter. In addition, their exclusive open-box shape provides far greater filtering area than conventional filters with the same face dimensions, permitting use in high-velocity applications with the efficiency of low-velocity operation. And . . . they last 6 to 12 times longer than other types of air filters.

Available in a wide range of sizes and shapes—cubes, panels, rolls, and pads—ULOK Air Filters are suitable for both new and modified systems. For detailed information on the complete line of ULOK Air Filters, including efficiency and pressure-drop charts, write:

UNION CARBIDE

#### UNION CARBIDE DEVELOPMENT COMPANY

Division of Union Carbide Corporation
Dept. A, 278 Park Avenue, New York 17, New York

UNION CARRIDE, ULOK, and DYNEL are registered trade marks of Union Carbide Corporation



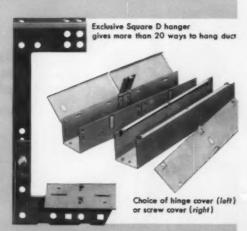
**FASTER AND AT MUCH LESS COST!** 

Before you decide to install conduit on a job, check to see if you shouldn't be using Lay-in Duct instead. Experience shows that in 1 out of 7 cases, the job can be done faster an? at substantially less cost with Lay-in Duct.

Not only that, but Lay-in Duct makes it easy to add extra circuits later on, makes machinery circuits readily accessible, makes it simple to modify layouts. Lay-in Duct is completely reusable, requires less labor on multiple circuits.

You get extra advantages when you use SQUARE D Lay-in Duct. You can choose from two types—hinged cover or screw cover—and from the most complete line of fittings available. All fittings can be used with either type. You get the fastest installation—quick couplings. The exclusive Square D hanger gives exceptional flexibility—provides more than 20 ways to hang Square D wireways. You get real rigidity, too—joint design triples duct strength. Available in four sizes—2%, 4, 6 and 8 inches.

Wtite for Lay-in Duct literature. Address Square D Company,
1601 Mercer Road, Lexington, Kentucky





SQUARE D COMPANY

wherever electricity is distributed and controlled

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Military Reception Centre
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Jet Cell, Overhaul Buildings
and Test Facilities

Scandinavian Airlines Main Facilities Seaboard & Western Airlines Offices and Hangars

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The airlines like Nesbitt products. Idlewild's famous Arrivals Building alone contains over 21/2 miles (12,500 feet) of Nesbitt Sill-line Radiation-and in more than a score of other buildings at International Airport there are some 500 installations of Nesbitt radiation, unit heaters, heating and ventilating units, air conditioners, and heating and cooling surface. Contemporary designers, requiring appearance and flexibility as well as dependability in their heating equipment, find these in products made by Nesbitt-most conspicuously in Nesbitt Sill-line, the world's most beautiful perimeter radiation.

Weshill

SILL-LINE RADIATION

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5

PART 2

# Consulting Engineer

DIRECTORY OF
ADVERTISERS'
LITERATURE



Keep This Directory in Your Technical Reference File

ST. JOSEPH, MICHIGAN

**Dust Collectors** Air Conditioning & Refrigeration Equipment Building **Materials** Communication & Signal Equipment Electrical 10 **Apparatus** Engineers' Office & Field Equipment Fire Protection Equipment **Heat Exchangers** 18 & Water Heaters Heating & Ventilating 19 Equipment Highway, Bridge & 22 Street Materials Industrial Processing Equipment Instruments 24 & Controls Insulation & **Protective Coatings** Lighting Fixtures 30 & Accessories **Materials Handling** & Storage Facilities Mechanical **Power Transmission** Motels & Hotels Piping, Valves & 38 **Plumbing Supplies** Plant 43 Sites **Power Equipment** 44 & Fuels Pumps & 48 Compressors Structural Materials 50 & Equipment **Waste Disposal** 55 Equipment Water Treatment Equipment Index

Page

Air Cleaners &

# AIR CLEANERS & DUST COLLECTORS



### 1-Dust Collection Equipment

Bulletin 721 describes the *Dustkop* Series 300 dust collector designed for laboratory type grinding and polishing. It is an air recirculating type collector, with an air volume of 260 cfm to 314 cfm and a dust storage capacity of 1/10 cubic foot. Complete dimensional data are shown clearly on line drawings. *Aget Manufacturing Co.* 



### 7-Dust Control Equipment

Bulletin No. 805 describes a complete range of dry collection equipment including the multi-bag filter, uni-filter, glass bag filter, Whith-clone, special collectors, and accessories. Illustrated application data show how equipment is used in industry to collect dust and to reclaim reusable material. Illustrated. Dracco Division of Fuller Co.



### 2-Air Purification Equipment

Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application are provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification. *Connor Engineering Corp.* 



### 8—Glass Cloth Collector

Bulletin 283 describes construction and operating principles of AAF's AMER-therm glass cloth dust collector, which answers need for a fabric arrester where greater than normal efficiencies are required and high temperatures are a factor. Arrangements, air volume rating charts, and dimensions.





### 3-Industrial Dust Collectors

Catalog 359 describes briefly complete line of Torit dust collectors for industry. Current models of both self-contained cabinet cloth filter type and cyclone separators are illustrated with dimensions and specifications for each. Installation photographs illustrate all models in use. Accessories are listed.

Torit Manufacturing Co.



### 9-Dry-Type Air Filter

Bulletin 228 describes AAF Dri-Pak 2000 dry-type high efficiency, low resistance air filter. Shows ratio of media area. Frame arrangements. Diagrams show front and side elevations and include complete dimensional information. Performance and media data charted. Specifications and minimum space required. American Air Filter Co., Inc.



### 4—Diposable Air Filters

Bulletin B1, 4 pages, illustrated, describes extended service, disposable type cube air filters. Explains how five filter faces are responsible for higher efficiency and longer life. Typical bank arrangements are diagramed. Tables and graphs show factual data. Installation and assembly described.

Union Carbide Development Co.

Catalog 1435 describes Westinghouse's heavy duty Model PD Precipitron. This

comprehensive catalog outlines the principle of electronic air cleaning and shows in cutaway the construction. Diagram

illustrates sectionalized arrangement to

provide continuous air flow and cleaning. Selection data include dimensions.



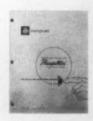
# 10—Fume and Mist Precipitator

Bulletin 251C describes Model B Electro-Mist, electronic precipitator for oil mist, fume collection. Self-contained unit cuts fire hazards created by condensed oil mist, reduces need for frequent cleaning of adjacent areas, collects up to 10 gallons of oil per day for re-use, returns cleaned air to work room. American Air Filter Co., Inc.



# 11—Renewable Media Air Filters

Bulletin 248-E combines technical information for both the vertical and horizontal models of the Roll-O-Matic automatic renewable media air filter. Explains the modular design which permits easy, on-the-job assembly. Includes dimension drawings, capacity tables, shipping weights, discussion of media. American Air Filter Co., Inc.



# Westinghouse Electric Corp.

5-Electronic Air Cleaner

6—Electronic Air Cleaner
Bulletin 77-4209 presents, completely and concisely, all information necessary for the selection and specification of Honeywell's electronic air cleaner. Includes operation, capacities, physical sizes, equipment options, power requirements. Air system design considerations and sample specifications included.

Minneapolis-Honeywell Regulator Co.



### 12-Electronic Air Cleaner

Bulletin 249-C describes construction and operation of Rollotron electronic air cleaner which combines efficiency of an electrostatic precipitator with the minimum maintenance of an automatic-renewing, disposable media air filter. Requires no water, washing, draining, oiling of plates. No freezing problems. American Air Filter Co., Inc.



### AIR CLEANERS & DUST COLLECTORS continued



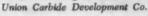
### 13—Electric Precipitators

Bulletin 104 describes electric precipitators manufactured by Buell Engineering Company. Line drawings show principle of operation and cutaway shows construction. The many features of this equipment are enumerated. Illustrations show installations in various types of industry. Nine installation steps given. Buell Engineering Co.



### 16-Panel-Type Air Filters

Bulletin Al, 4 pages, illustrated, describes advantages of new filter which provides up to 100 per cent longer life than other throw-away types. Describes how three-dimensional bat permits elimination of face supports and facilitates depth loading. Installation data, filter sizes, and arrangement.





### 14—Automatic Dust Collector

Bulletin FM60 describes new line of Torit fully automatic continuous operating dust collectors. Available in ranges up to 60,000 cfm and higher, these collectors are of extremely high efficiency, yet weigh less than one-half of standard equipment due to their aluminum construction. Illustrations show application. Torit Mfg. Co., Automatic Division.



### 17-Air Distribution and Purification

Bulletin 31F describes representative models in the Kno-Draft lines of air diffusers, grilles and registers, and high velocity equipment, and the Dorex line of air recovery and purification cells and canisters. Recent additions to the "Architects' Group" of rectilinear diffusers, type KO perforated, type KSS vari-pattern.

Connor Engineering Corp.



### 15-Mechanical Collectors

Bulletin AI-103 discusses the Aerotec line of mechanical collectors. Primarily concerned with the new Aerotec 10" cast iron Design 104, it also traces the application of Aerotec tubular centrifugal-type industrial collectors ranging from ½" in diameter to 3" in diameter, and 5", 6" and 10" tubes for fly ash. Aerotec Industries, Inc.



### 18-Dust Collectors

Bulletin 727 describes *Dustkop* dust collector Series No. 5000, which is suitable for grinding, buffing, polishing, woodworking machining, and other applications where large volumes of air are required. Will service up to eleven combinations of machines. Air volume 5000 cfm, capacity to 38 cu ft.

Aget Manufacturing Co.

# AIR CONDITIONING & REFRIGERATION



### 19-Spray Air Conditioners

Bulletin 58 describes apparatus for air conditioning by saturation spray method assuring control to tolerances of 1°F and 1% relative humidity in temperature range of 140°F. Units handling up to 23,000 cfm have cooling capacity capable of absorbing sudden peak loads holding constant conditions.

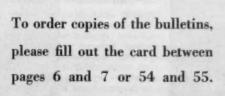




### 20-Multi-Zone Central Conditioners

Bulletin 34 describes multi-zone central station units for heating, cooling, dehumidifying, humidifying, and filtering. Supply heated or cooled air simultaneously and independently. Construction and operation data, numerous charts and graphs on coil ratings, K factors, and other technical information.

Marlo Coil Co.





### 21-Air Cooled Condensers

Catalog C-487, describes the complete line of Kramer air cooled condensing units for low and medium temperatures. Advantages of outdoor installation, with saving of valuable building space, made possible by Kramer's patented Winterstat® control are explained. Easy to use tables give accurate performance data. Kramer Trenton Co.

### AIR CONDITIONING & REFRIGERATION continued



### 22-Packaged Liquid Coolers

Bulletin GGP-261 describes packaged liquid coolers, condensing units, and engine compressors, natural gas engine driven. Cutaways show construction of various components. Complete specifica-tions are given. Optional equipment is illustrated and described. One of four bulletins. Others follow.

Bell & Gossett Co.



### 28-Low Silhouette Condensing Units

Eight looseleaf pages, Form 7017-1A, present technical data for "LSCU" low silhouette condensing units. Includes nominal ratings for 14 basic sizes, 5 nominal ratings for 14 basic sizes, 3 thru 40 tons, as well as specification comparison, wiring diagrams and dimensions for all models. Contains supplemental data to Bulletin 7017.

Dunham-Bush, Inc.



### 23-Natural Gas Engines

Bulletin PDG-461 gives physical data and fuel consumption for Bell & Gos-sett's natural gas engine driven pack-aged liquid coolers, condensing units, and engine compressors. Contains, in chart form, complete physical data on various models of this equipment. Fuel consumption cu ft/hr shown in graphs. Bell & Gossett Co.



### 29-Custom Room Conditioners

Bulletin ME-136 describes Chrysler's remote fan coil units for commercial and industrial applications, capacities 200 through 700 cfm. Charts give cooling and heating capacities for various mod-els. Exploded view shows installation sequence. Complete dimensional data include drawings.

Chrysler Corp., Airtemp Div.



### 24—Gas Engine Driver Units

Bulletin CUG-361 gives ratings and se-lection procedures for Bell & Gossett's natural gas engine driven condensing units and engine compressors. Detailed selection data, Line drawings show con-struction. Graphs show brake hp and capacity in tons at varying tempera-tures. Flow and pressure data. Bell & Gossett Co.



### 30-Dual Duct Air Mixing Units

Bulletin DD-6 describes dual duct air mixing units for high and low velocity systems. Detailed information includes blue prints showing different arrangements for same space, cross-section diagrams, dimensions, performance data, and complete specifications. Installation and product photographs are shown. Buensod-Stacey, Inc.



### 25—Packaged Liquid Coolers

Bulletin GUP-361 describes and gives complete information on Bell & Gossett's gasoline engine driven packaged liquid coolers. Selection procedures outlined and specific examples given. Ratings for each size tabulated as to various degrees of condenser water. Applications are given and units completely illustrated. Bell & Gossett Co.



# 31—Heating and Cooling Units

Catalog HC-1 gives complete construction specifications and dimensions on the Bohn line of direct expansion, water, and steam coils. This engineering manual is tailored to the needs of a specifying and design engineer as it provides a wide range of capacity data in easy-to-use direct selection tables. Illustrated.

Bohn Aluminum & Brass Corp.



# 26-Air Conditioning Silencers

A complete line of Aircoustat products by Koppers Sound Control Department is presented in bulletin 2166. Products covered include standard duct sound traps, circular silencers, return air vent silencers, and cooling tower silencers. Cutaway shows construction and fea-tures. Sales representatives listed. Koppers Co., Inc.

# 32-Electrionic® Control Centers

Advantages and types of Electrionic® control centers for air conditioning and heating systems are described in booklet F-8031-1. Graphic, selectronic, and identification centers for commercial and industrial buildings detailed. Flexibility explained and illustrated. Check list for control center planning.

Barber-Colman Co.



### 27—Packaged Chillers

"PC" Package Chiller Catalog 8023A lists mechanical specifications (20 thru 100 tons), construction details of chiller, cleanable condenser-receiver, heat inter-changer. Compressor data, selection guide, capacity and pressure drop tables, dimensional diagrams for semi-hermetic and direct drive models. Dimensions.

Heat-X, Inc., Sub. of Dunham-Bush.



### 33—Individual Room Conditioners

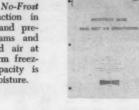
Bulletin 381A describes Acme's Flow-Temp® individual room conditioners. Cutaway shows construction and component features pictured. Complete physical specifications included. Fan, coil, motor, and filter data are tabulated, as well as capacitity data. Various models diagramed and keyed to dimensions. Acme Industries, Inc.

# AIR CONDITIONING & REFRIGERATION continued



### 34-Quick Food Freezing

Bulletin 144 describes the No-Frost method for continuous production in quick freezing food produce and prepared food specialties. Diagrams and photographs show how chilled air at high velocity is held at uniform freezing temperature and full capacity is kept constant by removal of moisture. Niagara Blower Co.



# 39-Dual Duct Air Conditioning

Bulletin DD-7 discusses space requirements for risers, apparatus rooms and ceiling arrangements for dual duct air conditioning systems. Includes basic apparatus arrangements, methods of design, and a discussion of the results to be obtained. Isometric examples of air distribution methods and other information. Buensod-Stacey, Inc.



### 35-Coil-Type Spray Dehumidifier

Bulletin 37 gives complete information on Marlo coil type spray dehumidifiers for washing, cleaning, humidifying, dehumidifying, heating and cooling, available in 327 sizes, air volumes from 600 to 76,000 cfm. Bulletin includes design specifications, dimensional data, and engineering data.

Marlo Coil Co.



### 40-Direct Expansion Colls

Bulletin 6001A is an engineering and selection guide for direct expansion coils for cooling; water coils for cooling and heating; steam coils, standard and nonfreeze. In addition to coil capacity and construction details, rating tables, summer and winter climatic conditions for United States and Canada are included. Dunham-Bush, Inc.



### 36-Return Air Vent Silencers

To order copies of the bulletins,

please fill out the card between

pages 6 and 7 or 54 and 55.

Bulletin 2000-M88 describes Aircoustat Koppers Co., Inc.



### 41-Air Conditioning Units

Bulletin 230 describes Bohn's new line of remote air conditioning units. Capacity data given for direct expansion, cold water, hot water, and steam. Six models provide cooling capacities from 2 to 15 tons to handle a wide variety of applications. Tables show refrigeration and air conditioning capacities. Bohn Aluminum & Brass Corp.



vent silencer, a sound trap used in preventing the transmission of noise from one area to another. Typical installa-tions are diagramed. Complete sizes and dimensions for all models are given. Installation data, performance chart, and chart of pressure drops between areas.



### 42-Ceiling Diffusers

Catalog F-4085-6 includes descriptions of Venturi-Flo ceiling diffusers, applica-tion and selection data, and ordering information. Revised performance tables make selection easier and faster. Deflectrols, volume controls, and other accessories are also included. Installation instructions given. Barber-Colman Co.



### 38-Air Conditioning Equipment

Bulletin 6011C describes compact line of air handling units. Contains valuable engineering section including methods of coil selection, typical design problems and example, as well as basic engineering information on air conditioning and heating fan capacities. Coil ratings and complete dimensional data are included. Dunham-Bush, Inc.



### 43—Packaged Water Chillers

Acme Model HE Flow Therm packaged water chillers are described in Catalog 535-A, including construction details, complete specifications, dimensional and capacity data. The HE line offers 8 compact models, in capacities from 20 to 125 tons, all factory assembled, tested and ready to install. Acme Industries, Inc.



### 38-Air Conditioning Equipment

Bulletin ME-137 contains detailed drawings and specifications on Chrysler Airtemp's AH Series air handling units. The units range from 2,000 to 15,000 ofm and have nominal capacities of 7% tons through 50 tons. Two pages are devoted to installation versatility of these units. Tabulated technical data. Chrysler Corp., Airtemp Div.



### 44-Pretreatment Chemicals

Nalco Technical Data File C4 contains information on Nalprep pretreatment chemicals, a new concept in protecting cooling systems against corrosion. Includes technical data sheets, a process bulletin, and reprints which describe this unique process for protection. Easily filed and readily available. Nalco Chemical Co.

### AIR CONDITIONING & REFRIGERATION continued



### 45-Air Cooled Condensers

Catalog U-485 describes Kramer Unicon remote, air cooled condensers in an un-limited range of capacities. A completely reliable tabular selection method is presented that dispenses with complicated calculations, yielding accurate results. Data on Winterstat® control heat pump, and integrated assemblies.

Kramer Trenton Co.



### 46-Engineered Air Distribution

Condensed catalog F-4471-8 allows designers of air distribution systems to quickly survey the wide range of equip-ment designs, sizes, finishes, and appli-cations available from Barber-Colman. Included in this 1961 catalog is information on new continuous-line diffusers in several basic styles.

Barber-Colman Co.



### 47-Automatic Ice Maker

Bulletin M210.05-S describes York's automatic ice maker, Model DER25F, air or water cooled, which produces spar-kling fragments of ice. Complete specifications include capacity, pounds of ice per 24 hours, in tabular form. Physical data and dimensions are given. Accessories and modifications are described. York Corp.



### 48-Air Conditioning Cabinets

Bulletin AC-121-A gives complete specifications and performance data on model G Buffalo air conditioning cabinets: Type PC (horizontal) floor or ceiling operation; Type VPC (vertical) floor operation; Type PCW (horizontal, spray coil) floor operation; Type VPCW (vertical, spray coil) floor operation. Buffalo Forge Co.



### 49-Duct Humidifiers

Bulletin 504 describes Armstrong's duct humidifiers with steam jacketed distri-bution manifold, Available in two sizes with pneumatic or electric control, manifolds 12" to 72" long. Line drawings show how manifold is heated and how humidifier works. Schematics show construction. Capacities and sizing. Armstrong Machine Works



### 50-Air Conditioning Apparatus

Manual 304-1 provides 36 pages comprehensive technical data enabling to scientifically select the proper surface for air cooling, dehumidifying, or heating applications, when using water as the transfer medium. Text is amplified by charts, graphs, formulas, and numer-ous specific examples. Casing dimensions. John J. Nesbitt, Inc.



### 51-Air Conditioning Equipment

Condensed bulletin 600 describes re-frigeration and air conditioning equip-ment manufactured by Refrigeration Ap-pliances, Inc. Outlines equipment for many applications. Various types of equipment illustrated. Model number, capacity, air cfm, motor data, fan size, weight, and dimensional data tabulated. Refrigeration Appliances, Inc.



### 52-Control Centers

Publication 1040 describes the latest developments for centralized control of air conditioning, heating, and ventilating systems. New modular units include equipment for data collection, indication, recording, motor control, digital indication, data logging, alarms, and intercommunication. Illustrated. Johnson Service Co.



### 53—Food Refrigeration

Bulletin 699 describes Snopan for refrigerating food, for counter display, ice cream and dessert displayers; Steempan for steam tables, bain maries, plate warmer cabinets, shelf warmers and other uses. Illustrations show construction applications and layout dimensions. Specification data are given. Dean Products, Inc.



### 54-Air Diffusers

Bulletin K27-A illustrates and describes linear and rectangular series air diffusers. Offered in three series - square, panel, long-slotted - units combine best air distribution and modern styling. Dimensional drawings for several types in each series provided. Complete selection and performance data, list of agents. Connor Engineering Corp.



# 55—Commercial Air Conditioning

If you design or specify commercial air conditioning systems, you will be in-terested in this new Carrier catalog 50K86 on water and air cooled packaged equipment. It furnishes complete de-scriptions, ratings, and dimensions on 4 commercial models. Cooling capacities range from 7.5 to 20 tons. Carrier Air Conditioning Co.



### 56—Centrifugal Liquid Chillers

Bulletin 4326 describes packaged centrifugal liquid chillers for low, medium, and high capacities. Detailed are Packaged Tonrac, Versare, Single-Stage Tonaged Tothac, versare, single-stage Tota-rac, and Double-Stage Tonrac. All are illustrated. Cutaway shows construction. Design features are listed. Includes self-contained air conditioning equipment. American-Standard, Industrial Division.

# BUILDING MATERIALS



### 57-Fire Guard Nailing Panel

Bulletin AD-104-961B describes Armstrong's fire guard nailing panel for bar joist construction, new low cost fire protection. This is a fire-retardent mineral fiber board ceiling material which provides two hour fire protection. Includes material specifications. Outlines installation procedures. Branches listed. Armstrong Cork Co.



### 63—Reinforced Plastic Panels

Bulletin K960 describes Kemlite's line of glass fiber reinforced plastic panels, translucent and surfaced plywood. Tabu-lated specifications include forms and dimensions, finishes, colors, and sizes. Includes application information and recommendations. Design patterns are illustrated. Ordering information. Kemlite Corp.



### 58-Ventilating Ceilings

Bulletin describes Armstrong's ventilating ceilings, a new air diffusion system employing a ceiling with thousands of perforations through which conditioned air is pushed. Outlines advantages, functions, and technology. Some recent in-stallations of ventilating ceilings are given. Offices in United States listed. Armstrong Cork Co.



### 64-Polyester Acoustical Tile

Special 5 x 8 inch samples of Kemdot, glass fiber reinforced polyester acoustical tile have been prepared for distribution to consulting engineers by the manufacturer, Kemlite Corporation. Available in white and pastel colors. Samples come in envelopes which provide complete technical and test data. Kemlite Corp.



### 59—Spring-Assisted Access Doors

Catalog describes horizontally hinged spring-assisted access doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, flush floor doors, sidewalk doors, basement doors. Specification outlines materials, prices, and weights. Line drawings show operation. Sales offices listed.



### 65-Curtain Wall Systems

Catalog C-62 outlines Bayley aluminum or steel curtain wall systems and insulated panels with Bayley aluminum projected windows. Advantages of Bayley curtain walls include choice of distinctive wall treatment without cost of special design, a wall engineered to accommodate a building's movement. William Bayley Co.



### 60-Spring-Assisted Doors

BILCO Co.

Scale detailed drawings of horizontally hinged spring-assisted doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, floor doors, pit doors, and basement doors with steel stair stringers. Specifications, standard sizes, and weights included. Sales offices in this country and Canada listed. BILCO Co.



### 63-Steel Windows

Catalog S-61 describes the complete line Catalog S-61 describes the complete line of Bayley Steel Windows, including Bayley original features. The booklet includes such items as projected windows, pivoted windows, classroom and ribbon windows. Also included are detention windows. Dimensions, construction, design, fasteners, and finish. William Bayley Co.



### 61-Industrial Glassware

Bulletin 91 describes the wide range of Vycor brand glasses, which are suitable for applications beyond the range of any other commercially produced glasses except fused silica. Bulletin is printed in easy to read type with informative pictures, graphs and charts. Physical properties given. Corning Glass Works.



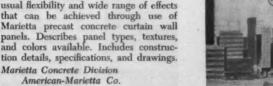
### 67—Insulated Metal Curtain Wall

Catalog W-61 describes Mahon's insulated metal curtain walls and Underwriters' Rated fire walls. Cutaways show various types of wall, photographs ap-plication, and line drawings details. Curtain wall load table and complete specifications help in specifying proper materials. Typical construction details. R. C. Mahon Co.



### 62-Precast Concrete Curtain Wall

Four-color brochure illustrates the unusual flexibility and wide range of effects that can be achieved through use of Marietta precast concrete curtain wall panels. Describes panel types, textures, and colors available. Includes construction details, specifications, and drawings.





### 68-Steel Curtain Wall

Publication ADUCO 91035-60 outlines the many advantages of steel curtain wall. Discusses individual merits and suitability of stainless and porcelain enameled steel wall systems. Special section on recently designed buildings shows methods of construction through use of section and isometric drawings. United States Steel Corp.

# COMMUNICATION & SIGNAL EQUIPMENT



### 69—Structural Sound Systems

Structured Sound Systems literature package to simplify specification of equipment for auditoriums includes 14 fourpage folders. Each gives sound equipment recommendations for a typical auditorium of a specific size and configuration. Auditoriums range from 300 to 2000 seats. High and low level systems, Radio Corporation of America



### 75—Automatic Control Time Switches

Bulletin 80 describes MC time switches for automatic control of mechanically-held contactors and low voltage remote control systems. Bulletin contains wiring diagrams, case dimension drawings, switching and switch rating information. MC controls make possible automatic control of low voltage relays and systems. Tork Time Controls, Inc.



### 70-Functional Sound

Product catalog S-11D describes and illustrates Stromberg-Carlson's full line of communications systems including Pagemaster selective wireless paging system and private automatic telephone systems. The catalog includes planning check list and selector chart. Components and accessories are illustrated.

Stromberg-Carlson.



# 76-In-Wall Amplifier

Specifications 4.1.14 describes Rauland-Borg's new In-Wall amplifier for permanently installed sound systems. Back box requires only 4 inches depth. Complete engineering specifications are given. Unit is illustrated. Wiring diagram included. This completely transistorized amplifier has 4 low impedance microphone inputs. Rauland-Borg Corp.



### 71-Underground Telephone Cable

Catalog T-6-61 contains information on General Cable and their subsidiaries' products giving complete package data for underground installation. Includes cable characteristics, dimensions, weight, and packaging. Also includes a complete telephone engineering and construction manual on the design of buried plant. General Cable Corp.



### 77—Solid State Annunciators

Bulletin 111 describes Panalarm's new Panastat miniaturized, compact, solid state annunciators. Complete specifications on all types. Selection charts for all standard sequences. Complete dimensional data includes diagrams of various cabinets. Logic diagram is accompanied by detailed explanation.

Panellit Div. Information Systems, Inc.



### 72-Closed Circuit TV

Bulletin YI-3000 describes closed circuit TV, engineered by Blonder-Tongue. Includes transitorized cameras, mobiletelevision console, 16mm film chain, projection video monitor, and direct view monitors. Also included is a complete line of accessories. Complete specifications given on all equipment.

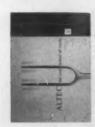
Blonder-Tongue Laboratories, Inc.



# 78—Telephone Switches

Brochure 8002 describes DuKane private automatic telephone systems for any type of building requiring 2 to 200 or more telephones. Block specifications shown on 7 of 9 systems with each model illustrated. Special chart describes savings in increased efficiency. Additional information on request.

DuKane Corp.



### 73-Stereo and Hi-Fi Music Systems

Altec's new catalog AL 1302-1 features illustrations of custom stereophonic and monophonic installations. A special feature is the selection chart which diagrams the proper placement of speakers and other components in a room. All components are described in detail, with technical information and specifications. Altec Lansing Corp.



# 79—Time and Program Controls

"It's About Time" booklet lists application studies and descriptions of central time and program controls, time stamps, attendance and job cost time recorders. Describes RC6000 Remote On/Off cost saving control of heating, light, air conditioning and ventilation. Outlines Transacter data gathering.

Stromberg Division, General Time Corp.



# 74—Personnel Paging Systems

Bulletin A-100 describes the new Edwards Lokator, an audible paging system designed to page key personnel wherever they are needed in a hurry. Foolproof operation, automatic code paging, designer styling to blend with office decor and rugged construction. Twenty, forty, and eighty call systems available. Edwards Co., Inc.



### 80-Modular Sound Select-a-Guide

Bulletin 3J3668 is fold-out brochure which describes plan and functions of the new RCA Modular Sound Systems. Systems feature a variety of standard assemblies suitable for mounting in any of five basic cabinet units, enabling you to select the exact combination of sound functions and controls you require. Radio Corporation of America.

# COMMUNICATION & SIGNAL EQUIPMENT continued



### 81-Fire Alarm Systems

Catalog F249 comprises several bulletins in a binder completely describing Flexalarm, Gamewell's fire alarm systems. Bulletin F249A describes and illustrates the systems components; F249C gives complete specifications and circuit diagrams; 131 and 132 detail local fire alarm control cabinets. Special systems. Gamewell Co.



### 87-Perimeter Security Systems

Bulletin 66D describes the Powers-Mosler Radi-Matic Barrier, an electronic fence which provides perimeter protection for storage depots, industrial property, military installations, and other areas needing maximum security. Includes description of monitor unit, transmitter, and antenna. Specifications given. Powers Regulator Co., Powers-Mosler Div.



### 82—Bells and Chimes

Bulletin A-4 illustrates all Autocall bells and chimes. Tables show the dimensions of all sizes and charts show the amount of current required for any desired voltage. Bells are furnished in vibrating and single-stroke models, both in standard and weatherproof styles for interior and exterior.

Autocall Co.



# 88—Program Signal Timer

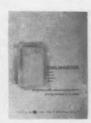
Bulletin 82 describes program signal timer 5700SK designed expressly for automatically sounding signals in factories and schools. Insures signalling precisely when desired. For automatic sounding of municipal, fire house, sirenand whistles. Signals at any hour or hours of the day or night, on the hour. Tork Time Controls, Inc.



### 83-Sound Systems for Schools

Bulletin 1.1.6 describes a new low cost central sound system for schools. Engineering specifications include data on equipment, console, master control panel, amplifier, tuner, and automatic record player. Also included is typical specifications on sound system accessories for modern school coverage.

Rauland-Borg Corp.



### 89-Private Automatic Telephone

Product bulletin, 118-IC describes and illustrates Stromberg-Carlson's private automatic telephone system Dialmaster. The system will handle up to 178 internal communicating lines including numerous additional features. Electronic and design features are detailed. Control panel illustrated. Stromberg-Carlson



# 84—Snap-On Window Bezels

Bulletin 112 illustrates and describes new annunciator snap-on window bezels which permit instant bulb and nameplate changing, without tools, and provide an easier, non-glare viewing angle. Snaps on instantly to existing Panalarm Model 51 annunciator systems. Standard on all new Panalarm Model 51 cabinets. Panellit Div. Information Systems, Inc.



### 90—Speaker select-a-guide

Speaker Select-a-guide, form 3J4217, for planning auditorium sound systems. Brochure contains descriptions and specifications for recommended speakers, a quick method for calculating number of speakers required, diagrams showing location of speakers for both high and low level sound coverage in auditoriums. Radio Corporation of America



# 85-Writing TV Specifications

Bulletin tells how to write specifications for a master TV antenna system. Includes general requirements, system function and capabilities, head end equipment specifications, distribution equipment specifications, general equipment requirements, and equipment tests. School, motel, hotel fields.

Blonder-Tongue Laboratories Inc.



# 91-Inside Plant Telephone Cable

Catalog T-2-61 is a technical manual on telephone cable for use inside the plant. Complete cable data is given including color coding. Diagrams show positioning of wire colors. Contains information on conductor, insulation, cable formation, covering, dielectric strength, and resistance. Also data on power cable.

General Cable Corp.



### 86-Public Address Systems

New catalog SWC 17e/AL describes and shows examples of Altec's sound system building block flexibility. Each specialized component illustrated in the catalog is designed to work in complete harmony with every other item in the Altec line: microphones, amplifiers, preamplifiers, loudspeakers, and horns.

Altec Lansing Corp.



### 92-Sound and Communication Systems

Bulletin 8072 describes the depth of line in DuKane sound and communication systems. Shows equipment for industrial and school sound systems, private telephone systems, intercom systems, language laboratory systems, and nurses call systems. Includes all the engineered components needed for installation. DuKane Corp., Commercial Sound Dio.

# **ELECTRICAL APPARATUS**



### 93-New Compact Switchboards

Bulletin GEA 6734 describes GE's shallow depth, Type DR NEMA Class I and DR NEMA Class II switchboards. Layout and dimensional data given for incoming line and distribution sections. Circuit breaker and fusible switch units for main protective and branch devices. General Electric Co.

Distribution Assemblies Dept.



### 99—Engineered Electrical Fittings

Catalog Section G-1259 describes both weatherproof conduit expansion joints, cable supports, cable clamps, junction boxes and housings, and connectors. Each type of fitting is illustrated with a cutaway and pertinent information tabulated. Necessary information for ordering is included. Price list is included. Adalet Manufacturing Co.



### 94—High Speed Generators

High-speed synchronous generators, 30 to 300 kw, for standby and continuous applications, are described in bulletin 51B8909. Single-bearing, close-coupled units are available for direct connection to internal combustion engines; two-bearing units also available for belt drives or direct connection.

Allis-Chalmers.



### 100-Electrical Fittings

Bulletin 1022 lists box connectors, conduit fittings, entrance fittings, locknuts and bushings, connectors for M1 cable, outlet boxes and covers, fittings for service entrance cable, pull boxes, switch boxes, sealtite connectors, fittings for E. M. T. Prices, weight, dimensions, and packaging are included.

Appleton Electric Co.



### 95-Starting Switch Manual

Bulletin 600 describes Allen-Bradley's line of manual starting switches for ac and dc motors. Gives wiring instructions and construction. Each model switch is illustrated and described. Typical applications are pictured. Information includes prices and complete dimensional drawings. Order information.

Allen-Bradley Co.



### 101-Motor Control Selection Manual

Speeds and simplifies selection and ordering of Arrow-Hart motor controls for single and polyphase ac squirrel cage motors. Handy size for desk top or wall use. Covers full information including ratings, sizes, features, catalog numbers, prices, ordering data and complete heater tables. Profusely illustrated.

Arrow-Hart & Hegeman Electric Co.



### 96—Automatic Transfer Switches

Newly revised Catalog 57-S1R1 provides complete information (including pricing) on mechanically and magnetically held automatic transfer switches. Information on selection, design and application data, blackout control systems, 16 accessory features. Photographs show construction details. Also includes wiring diagrams. Automatic Switch Co.



### 102—Power Circuit Breakers

Bulletin 2031A describes I-T-E's Trend-Line power circuit breakers utilizing the single-tank breaker which has been field proven. Series of cutaways illustrate operation. Tabulated dimensions are keyed to diagrams and available ratings charted. Discusses pneumatic operating mechanism and breaker linkage system. I-T-E Circuit Breaker Co., Power Div.



### 97—Protective Fuses

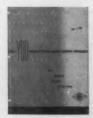
Bulletin HCS tells how Buss *Hi-Cap* fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.



# 103—Wiring Devices and Fuses

This six page bulletin lists federal specifications with which Eagle wiring devices and fuses comply. Conveniently listed as to style number, type number. Covers Federal Specifications numbers WC-596, WL-142, WR-151a, WR-00151b, WF-791b, WF-803A, WS-890, WS-893a, WS-896a, and MIL-F-15160c. Eagle Electric Manufacturing Co., Inc.



### 98—Circuit Breakers

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needless circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.



# 104—Mechanically-Held Contactors

Zenith Bulletin B-15 contains descriptive information, illustrations, drawings, and engineering data on: MHP Series mechanically held contactors for switchboard use, MH Series remote control switches for general use and 6MH Series for inductive and dc loads. Complete dimensions.

Zenith Electric Co.



### 105-Fuse-Fuseholder

New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-6 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection,

Bussmann Mfg. Div., McGraw-Edison Co.



### 106-Disconnect Isolators

Bulletins 138 and 140 describe isolators which are extremely compact switching devices for the 5 to 15 kv range. Unique telescoping action requires one third of space needed by equally rated knifetype switches. Included are complete specifications and directions on how to order. Completely illustrated.

James R. Kearney Corp.



### 107—Electrical Suspension Hardware

Four pocket portfolio contains bulletins 40-100, 40-200, 40-300, and 40-500. One booklet gives complete construction details of Preformed Armor-Grip suspension hardware, one gives detailed technical information, another outlines and illustrates application procedures, and the fourth is a price list.

Preformed Line Products Co.



### 108-Twin Load Centers

Bulletin GEA-7076 gives application and selection data for new rugged, low cost, industrial and commercial load centers. Complete line U/L listed, 12-42 circuits, 125-150-200 amps. Fully sequence phased for total versatility with *Twin*, 1-, 2-, or 3-pole breakers.

General Electric Co.

Circuit Protective Devices Dept.



# 109—Liquid-Immersed Transformers

Bulletin 2825 describes Moloney's liquid-immersed subway and vault-type network transformers. Design features are fully detailed and illustrated in photographs and line drawings. Standard accessories are described and pictured. Operation of disconnect and grounding switch outlined, diagramed. Moloney Electric Co.



# 110—Voltage Monitering

Descriptive bulletin 745 covers S&C potential devices for low cost voltage monitoring through 161 kv. It includes details on application, construction, and operation, as well as outline and circuit diagrams. Specification page lists available ratings, styles, dimensions, and accessories.

S&C Electric Co.



### 111-Emergency Electric Plants

Booklet F156 spells out why Onan electric plants are the best buy. Cites outstanding firms now buying Onan and lists entire line. Gives five reasons why Onan is preferred: 1. Good design; 2. Skilled workers; 3. Outstanding features; 4. Fully tested; 5. Performance certified by independent testing lab.

Onan Div. of Studebaker-Packard Corp.



### 112-Electrical Wiring Devices

Catalog 1101, Section 1, lists items for use in industrial and commercial wiring. All devices are described and illustrated. Complete information including packing weights and prices given. Indexed alphabetically and numerically. This is a ready reference catalog prepared especially for engineers and estimators. Leviton Manufacturing Co., Inc.



### 113—Switches and Outlets

Bulletin 3072 gives information on precision-made switches and outlets. Contains case histories as well as photographs of major modern commercial and institutional installations. Shows wide area in which P&S wiring devices are used. Photographs show switches and outlets suitable for applications.

Pass & Seymour, Inc.



### 114—Power Switching Centers

Bulletin F-1700D describes construction, standard assemblies and standard components for power switchgear with fused and unfused interrupter switches. Details of operation fully illustrated. Switch rating chart in standardized PSC arrangements gives voltage and current ratings and interrupting life.

I-T-E Circuit Breaker Co.



# 115—Compact Substations

Consultants interested in a new concept for distribution systems will find bulletin 61B9756 an important reference. New REGU/TRAN compact substation requires 25% less space than conventional substations resulting in lower installation costs. Describes and illustrates REGU/TRAN's many features. Allis-Chalmers.



### 716-Magnetic Motor Starters

Bulletin SM-298 describes Spin-top explosion-proof enclosures for magnetic starters. Also includes details on manual and high-voltage starters as well as control and timing relays, limit switches, push button stations and other control devices. All equipment listed is illustrated. Cutaways show construction.

Square D Co.



### 117-Dry-Type Transformers

Information on sound ratings, engineering advantages, typical applications, construction details, heat dissipation, installation, and custom designs included in bulletin 611 on dry-type transformers. Presented in pictorial and chart form, all sizes from ½ kva to 10,000 kva. Completely illustrated.

Sorgel Electric Co.



### 122-Copper and Aluminum Duct

Manual 5600 contains complete information on copper and aluminum feed-in and plug-in duct. Gives complete application details with photographs and diagrams, full construction data, plus specifications and dimensions in tabular form. All connectors, hangers and accessory equipment included.

Square D Co.



# 118—Low Speed ac Generators

Bulletin 510 describes Ideal's low speed engine-type ac generators rated from 10 to 10,000 kva at 80 to 450 rpm. Construction features are outlined and illustrated. Typical installations pictured. Advantages are listed. Special applications. Map shows locations of representatives and service facilities. Ideal Electric & Mfg. Co.



### 123-Meter Loop Replacement

Bulletin 315 covers the latest advance in replacement of meter loop, giving immediate 200 and 400 ampere farm and industrial service, both single and three phase. Details on the advantages of the Meter-Rite switch to both utilities and users are presented. Photograph shows construction and components.

System Analyzer Corp.



# 124—Interrupter Switches

Bulletin 1630A describes and illustrates are chute type interrupter switches, fused and unfused, for switching feeder circuits. Photographs show construction and operation. Switch rating chart includes voltage and current ratings, also interrupter life. Assembly forms diagrammed. Sales offices listed.

I-T-E Circuit Breaker Co.



# 119—Load Break Switch Tests

To order copies of the bulletins,

please fill out the card between

pages 6 and 7 or 54 and 55.

Bulletin P-112 gives detailed results of an extensive test series conducted on the Pringle load break switch for service entrance, 2000 and 4000 ampere, in both graphic and tabular form. Four basic types of tests were run to evaluate switch performance over a wide range of conditions. Tests Certified. Pringle Electrical Manufacturing Co.



# 125—Load Break Switches

Bulletin SC4.la contains descriptive information on high voltage load break switches and enclosures. Includes 5 and 15-kv stationary mounted metal enclosed units for substation incoming line sections. Included are detailed illustrations, drawings, diagrams, and specifications for planning.

Allis-Chalmers.



### 120—Pressure Contact Switches

Bulletin describes Barkelew's Bolt-Log® load break pressure contact switches, as well as dead front, rotary tap, oil immersed, and open knife switches. All models of switches are illustrated and all necessary specifications are given. Complete and detailed explanation of each type of switch is included.

Barkelew Electric Manufacturing Co.



### 126-Dry-Type Transformer Guide

Bulletin GEA-6907 is a specifiers' guide giving complete information on dry-type transformers, including data on how to select and apply; sound levels and construction features; application and ordering information. Described are general purpose transformers, autotransformers, buck-and-boost, stabilizing transformers. General Electric Co.



### 121—Synchronous Motors

Ideal low speed engine type synchronous motors 20 through 10,000 hp, 72 through 450 rpm are covered in Bulletin 502. Contains 12 pages of application, specification, and performance data. Application photos show various compressor and pumping installations when low rpm units are required.

Ideal Electric and Mfg. Co.



### 127—Dry-Type Transformers

Bulletin 200A covers Hevi-Duty's dry type transformers for power and lighting circuits. Tables include output, price, dimensions, net weight, and sound level value. Typical vector and connection diagrams are included. Features are keyed to photograph. Optional equipment is listed. Transformers illustrated. Hevi-Duty Electric Co.



### 128-Transformers and Substations

Bulletin 900 describes engineering and installation advantages of Sorgel drytype load center transformers and substations. Includes 15-point checklist in specifying transformer and substation gear. Equipment up to 10,000 kva and for all voltages up to 15,000. Photographs, cutaways, performance curves. Sorgel Electric Co.



### 134—Remote Control Operator

Bulletin B-7534 describes Westinghouse's electrical operator for remote control of types E, EH, F, and HF circuit breakers, Electric operator is same size and occupies the same amount of space as the breaker. Illustration with keyed dimensions. Schematic diagram shows circuit and operation. Applications. Westinghouse Electric Corp.



### 129-Bushings and Cable Terminals

Bulletin A-460 describes Adalet's Sali insulating bushings and cable terminals. Each product is illustrated, with cutaways where construction is pertinent. Complete engineering data is included. Tabulated is dimensional information, catalog number, packing details, and weights. Also included is price list. Adalet Manufacturing Co.



### 135—Metalclad Switchgear

Consultants can include 15-kv metal clad switchgear with 750 and 1000mva interrupting capacity in their substation planning. Bulletin 18S9963 de-scribes in detail the many outstanding features of the units. Photographs, elevation drawings, complete specifications, and engineering data. Allis-Chalmers.



### 130-Quiet ac Switches

Bulletin 327-G1371 describes the complete Quiette switch line by Arrow-Hart. Cutaways show construction and operation. Choosing the right switch is easy with the Quick-Selection chart. Included is information, ratings, and wiring diagrams on new models and special purpose switches. Completely illustrated. Arrow-Hart & Hegeman Electric Co.



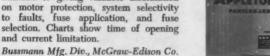
### 136-Motor Starter Manual

Manual 6100 describes Allen-Bradley's new and improved line of combination starters, reversing starters, multi-speed starters, and contactors. Photographs show construction and components, Complete dimensions on all equipment, Includes data on ratings, enclosures, overload protection, and controls. Allen-Bradley Co.



### 131—Basic Electrical Protection

Booklet PBP, just released by the makers of Buss fuses, covers basic definitions in the area of electrical protection in addition to giving valuable information on motor protection, system selectivity to faults, fuse application, and fuse selection. Charts show time of opening and current limitation.





### 137-Explosion-Proof Panelboards

Catalog 661 offers a revolutionary new type of explosion-proof panelboards manufactured by Appleton Electric Company. These panelboards are capable of using from 4 to 24 single pole circuit breakers. In this condensed catalog each model is illustrated and complete specifications are tabulated. Appleton Electric Co.



### 132—Automatic Transfer Switches

Bulletin 906-105 describes the new 1200, 1600, and 2000 ampere size ASCO mechanically held automatic transfer switches. These 2 and 3 pole vertical tandem, open type switches are catalog listed to 600 volts a-c, 250 volts d-c. Dimensions, list prices, ordering information, and shipping weights. Automatic Switch Co.



### 138—Pressure Contact Switches

Bulletin 101 describes Barkelew's Bolt-Log load break service entrance switches. Furnished in 1200, 1600, and 2000 amp capacities for 240, 480, and 600 volt 60 cycle ac service. Two, three, and four pole, fused or unfused, front or rear connection. Mountings, construc-tion, dimensions, and tests included. Barkelew Electric Mfg. Co.



### 133—Comparative Catalog Numbers

This 12 page bulletin is a speed-check list of comparative catalog numbers, listing the most commonly used wiring devices by manufacturers name. Devices of like function, manufactured by Eagle Electric Manufacturing Co., are cross referenced to Eagle catalog numbers. This is convenient for daily use. Eagle Electric Manufacturing Co., Inc.



### 139-Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption. Heinemann Electric Co.



### 140-Transformer Maintenance Manual

Manual T2RA is a guide to operation and maintenance of Hevi-Duty dry type transformers. Installation procedures cover location, inspection, handling, and grounding. Storage, maintenance, and operation detailed. Includes charts and photographs. Indications and causes of transformer failure are listed.

Hevi-Duty Electric Co.



### 146-High Frequency Bus Duct

Bulletin B-7326 describes Westinghouse's revolutionary new method of transmitting high frequency power. Frequency range from 180 to 20,000 cycles with voltage drop of less than 1 volt per 100 feet. Installation procedures, typical applications, features and components are shown. Closeup shows construction.

Westinghouse Electric Corp.



### 141-Plug-in Bus Duct

Bulletin XL-770 provides technical data including dimensions, size and weight features, and layout procedures for Bull-Dog's new plug-in bus duct featuring low voltage drop. Dimensions and specifications on higher capacity XL bus duct and new XL Riser bus duct.

I-T-E Circuit Breaker Co.
BullDog Electric Products Division.



### 147-Motor Power for Pumps

Bulletin 961 describes in detail the part dual-powered pumps played in installation of water and sewage systems in the Motor City. Photographs show the various installations and the equipment used is described. Depicts a wide range of equipment from 100 to 2750 hp motors. Complete installation photographs.

Ideal Electric & Manufacturing Co.



### 142-Wiring Devices Catalog

Catalog 60 is a 196 page loose-leaf catalog of electrical wiring devices. All devices are described and illustrated. Necessary dimensional data given. Indexed alphabetically and numerically. List of comparative catalog numbers as to use. Schedule of list prices will be found in back of catalog.

Leviton Manufacturing Co., Inc.



### 148-Distribution Load Break Switch

Bulletin 8C describes Kearny's ARI-60 interrupter switch featuring ARC-KO interrupter unit for high speed, dependable, and repeatedly circuit interruption. Photographs show operation and components. Cutaway details construction. Results of performance tests included, as well as ratings and dimensions.

James R. Kearney Corp.



# 143—Standby Generator Installation

Bulletin R-235 is a thorough, unbiased analysis of the factors to consider when installing emergency electric generating plants. Intended as a guide to their proper installation, this bulletin points out the more common problems that arise during the planning stage. Analyzes several typical installations.

Onan Div. of Studebaker-Packard Corp.



### 149—Transformers

Bulletin 815 describes Moloney's subway distribution transformers. These are constructed to withstand complete submersion in water without damage or service interruption. Design features are illustrated and accompanied by complete details. Specifications for standard accessories are charted.

Moloney Electric Co.



### 144—Electrical Controls

Bulletin A-17 features automatic transfer switches for instantaneous transfer from normal to emergency source when uninterrupted current is essential, magnetic contactors to control lighting and power circuits when push button or pilot controls are operated, special electromagnetic controls, timing devices. Zenith Electric Co.



### 150—Condensed ac Switch Catalog

Bulletin 3077 show, in condensed form, the complete line of P&S ac switches for every type of wiring job. Switches are illustrated and specifications and model number given. Rocker-Glo switches with quiet, easy rocker action shown. Results of Underwriters' Laboratories comparison tests are included.

Pass & Seymour, Inc.



### 145—Dry-Type Transformers

Bulletin GEA-6790 describes newly designed line of C<sub>0</sub>F<sub>8</sub> gas-filled sealed drytype transformers. Units offer lighter weight, smaller dimensions, and higher impulse levels than former nitrogen units. Included are standard and optional features, photographs, electrical characteristics, weights and dimensions. General Electric Co.



### 151—Switchboard Manual

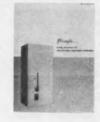
New Switchboard Manual 2600 gives complete construction features of Square D switchboards including provisions for grounding and fault protection. Application information with typical plant layout suggestions are provided. Also covers the many types of sections available and gives full dimension data.

Square D Co.



### 152-Metalclad Switchgear

This 36-page brochure describes S&C metalclad switchgear. Application and performance, components, specifications, and accessories are described and illustrated. Photographs and diagrams show how metalclad switchgear is used in industrial distribution systems. Excerpts from 1959 National Electrical Code. S&C Electric Co.



### 158-Load-Break Entrance Switches

Bulletin S-123 describes the new Pringle line of electrically-operated load-break service entrance switches, with Bolted pressure. The new switches open and close remotely, manually and electrically. Safety interlocked to assure the ultimate in reliability. Cutaway view of the switch with operating details.

Pringle Electrical Manufacturing Co.



### 153—Saturable Reactors

Bulletin 658 describes Sorgel's saturable reactors, to regulate and control electric power for various manufacturing processes. Reactors from 15 kva to 470 kva are pictured. Typical single phase reactor circuit shown. Enclosed is a sheet listing required information for quotation on saturable reactors.

Sorgel Electric Co.



### 159—Three Phase Converter

Bulletin 400 describes the single to three phase conversion line with emphasis on the Add-A-Phase converter for up to 30 hp motors, and the Power Twin-Universal motor which operates on both single and three phase with designs to 60 hp. Operational data and performance curves are included. Photographs of installations. System Analyzer Corp.



### 154—Packaged Unit Substations

New Bulletin SD-137 describes Square D Power-Zone package unit substations, available with capacities to 500 kva, primary voltages to 4800 volts and secondaries to 60 volts. Bulletin explains advantages of Square D design, illustrates features, and lists the many accessory devices available.

Square D Co.



### 160-Encapsulation Wound Motors

Solid-cast encapsulation for windings of U. S. Motors to protect against heat, fog, cold, acids, fumes, caustics, abrasives, oils, salt, water spray, or other rugged and destructive environments is described and illustrated in bulletin F-2034, Exclusive U. S. Motors Everseal formula and solid-cast method.

U. S. Electrical Motors Inc.



# 155—Distribution Centers

Bulletin GEA-6928 describes GE's drytype integral distribution centers featuring QHT transformers for applications up to 5000 volts. Installation instructions, features, dimensions and cable space, selection data, ratings, and panelboard components are included. Material specification form helps you specify.

General Electric Co.



### 161-Die-Cast Aluminum Conduits

Bulletin 2730 describes and lists Crouse-Hinds' copper-free die-cast aluminum Condulets. Covers every type of conduit fitting. Each is illustrated. Sizes, catalog numbers, and list prices. Dimensions are charted and keyed to diagrams. Includes straight connectors, reducers, enclosures, and lighting fixtures. Crouse-Hinds Co.

### 156—Silicone Insulated Motors

Bulletin 1C-106, "Specify Silicone Insulated Motors and Transformers and Save" describes several ways to save on initial equipment, installation, and maintenance costs. Five ways in which major manufacturers are using silicone insulation systems in improved equipment designs are also reviewed.

Dow Corning Corp.



### 162—Packaged Generators

Bulletin 2100-PRD-202 is an informative booklet on packaged generators. It ex-plains how Electric Machinery's pack-aged generator with built-in automatic voltage regulator works. Includes mountings and drives and electrical informa-tion. Information for generator selection, and tables for figuring wire sizes.

Electric Machinery Mfg. Co.



NOT JUST MORE

MORE CAPACITY

### 157—Large Capacity Storage Batteries

Bulletin 6538 describes the new TSC Exide-Ironclad battery with electrical capacity of 85 ampere-hours per positive plate. Provides most power per cubic inch for electric industrial trucks. Material handling power boost of 61/8 was achieved without change in physical dimensions, including critical height. Exide Industrial Marketing Division.



### 163-Explosion-Proof Junction Boxes

Technical bulletin on junction boxes, explosion-proof, dust-tight, and weatherproof, manufactured by Killark Electric Manufacturing Co. This bulletin, de-signed to fit loose-leaf binder, includes all information necessary for writing specifications and ordering. Dimensions for all models tabulated.

Killark Electric Manufacturing Co.



### 164—Electrical Support Hardware

Buletin EHV-200 describes Preformed Line Products Company's support hardware for high voltage transmission lines. Includes Armor-Grip Supension assembly, Corona-Free suspension hardware, and Preformed spacers. Photographs show construction and components. Contains application data, specifications. Preformed Line Products Co.



### 170-Underfloor Duct Systems

Catalog 203 describes the Orangeburg underfloor duct system, non-metallic un-derfloor raceways for distribution of electrical wiring in commercial, indus-trial, and institutional buildings. Drawing keyed to index shows components, which are also pictured and described. Instructions for installation given. Orangeburg Manufacturing Co., Inc.



### 165-Open Dry-Type Transformers

Bulletin GEA-6668 describes light W eight, low sound open dry-type transformers rated 300 to 2500 kva, 15 kv and below. Includes incoming switches and cable compartments. Eight page book contains electrical characteristics, standard and optional features, weights and dimensions, and illustrations. General Electric Co.



### 171—Circuit Breaker Panelboards

Bulletin SD-126 defines panelboard quality requirements, describes complete line of Square D circuit breaker panelboard types and applications. Functional requirements of different voltage systems as well as special features are discussed. Selection tables for both panelboards and circuit breakers included. Square D Co.



### 166-PVC Rigid Conduit

Bulletin KE 1058 is a new 20-page rigid polyvinyl chloride electrical conduit catalog. Included are comprehensive test results, specification information, installation instruction, corrosion resistant charts, and other valuable data. Illustrations show various types of pipe and fittings. Pictures show proper assembly. Kraloy/Chemtrol Co.



### 172—Cables for Power Circuits

Bulletin 1037 describes Simplex Anhydroprene XX cables for power circuits up to 600 volts, designed for service in ducts or conduits or as open wiring in buildings. The jacket is a balanced compound of neoprene and other ingredients which provides balanced resistance to sunlight, oil, acids, heat, flame, abrasion. Simplex Wire & Cable Co.



# 167-Outdoor Air Switch

Bulletin 1240-2A describes I-T-E's TTR-6, a vertical opening, group operated, outdoor air switch. This all-new aluminum switch has been designed for weight reduction, and to maintain electrical and mechanical characteristics. Cutaway shows construction. Electrical, mechanical properties in tabular form. I-T-E Circuit Breaker Co.



### 173—Laboratory Electrical Fittings

Engineers' manual E details electrical pedestal fittings for use in laboratories, hospitals and schools, all Underwriters' approved. Also includes conduit, rack box, and flush box fittings. Dimensional drawings give details on pedestal fittings. Condensed descriptions of fittings charted. Complete price list included. Water Saver Faucet Co.



### 168-Low Voltage Circuit Breakers

Bulletin describes Mears' air and fused circuit breakers of 600 through 4,000 ampere frame sizes. These breakers are electrically or manually operated, and offered in fixed switchboard, plug-in, and drawout mountings. Includes, prices, dimensions, weights, modifications, and application tables and charts. Mears Controls, Inc.



### 174-Steel Electrical Raceways

Bulletin SPA-034-461 describes Buckeye and Yoloy steel electrical raceways for and foloy steel electrical raceways for modern construction. Various types of conduit are illustrated. Chemical prop-erties are given. Photographs show in-stallation while buildings are under con-struction. Conform with the require-ments of Underwriters Laboratories. Youngstown Sheet and Tube Co.



### 175—Gas Engine Generator Sets

Bulletin DN1104 describes Caterpillar's diesel and gas engine driven generator sets. Cutaway of exciter and control circuit. Schematic shows generator circuit and cutaway construction of generator. Graph shows close voltage control. Selection charts for both diesel and natural gas engines included.

Caterpillar Tractor Co.



### 169-Magneite Motor Starters

Bulletin SM-293 covers Square D line of magnetic starters. New 8-page bulletin gives construction features of magnetic starters from NEMA Size O through Size 5, demonstrates installation, inspection and maintenance routines. Also describes field modification kits and variety of enclosures available. Square D Co.

# ENGINEERS' OFFICE & FIELD EQUIPMENT



### 176-Closed Circuit TV

Bulletin ATVB-100.1 describes closed circuit TV, black and white or color, for surveillance, transportation, dispatching, and observation of hazardous locations. Also describes the *Mini-Camera*, one of the smallest TV cameras in the world, cylindrical in shape, can observe the interior of a 3" pipe.

Fairbanks, Morse & Co.



### 179—Data Processing Systems

Describes the outstanding performance characteristics and processing opportunities presented to the engineering and research professions by the new expanded 1620, with storage increased to 60,000 positions and high speed punched card input and output. Component units illustrated.

International Business Machines Corp.



# 177—Microfilming Systems

A presentation of modern microfilming in booklet form by Recordak, the originator of modern microfilming. Explains the system in precise form. Show sample films of the various steps in recording a specific engineering drawing. Finally reproductions of the film printed on opaque and translucent vellum stock. Recordak Corp.



### 180—Solid-State Processing System

Booklet serves as a brief, compact introduction to the 7074 solid-state data processing system. Topics covered include modularity, speeds, and program compatibility with the 7070. Fast and economical. A list of programs available from the 7074/7070 programming library is also included.

International Business Machines Corp.



### 178—Portable Mircrofilmer

Bulletin A-948 describes the new Recordak portable microfilmer. Illustrated in full color, this six page folder explains and illustrates the outstanding features. This portable microfilmer weighs less than an office typewriter, 24 lbs, and measures 6%" x 15%" x 12%". Fits compactly into a handy carrying case. Recordak Corp.



### 181—The Consulting Engineer

Bulletin issued by John Wiley & Sons describes book they publish entitled "The Consulting Engineer." C. Maxwell Stanley, senior partner of Stanley Engineering Co., is the author. Part I deals with the engineer's relationship with his client and Part II with internal problems of a consulting engineer practice. John Wiley & Sons, Inc.

# FIRE PROTECTION EQUIPMENT



## 182—Fire Alarm Systems

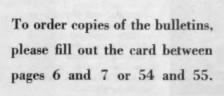
Catalog F249 comprises several bulletins in a binder completely describing Flexalarm, Gamewell's fire alarm systems. Bulletin F249A describes and illustrates the systems components; F249C gives complete specifications and circuit diagrams; 131 and 132 detail local fire alarm control cabinets. Special systems. Gamewell Co.



## 183—Vertical Fire Pumps

Bulletin 401 describes in detail Layne vertical fire pumps especially designed to pump from wells, reservoirs, lakes, rivers, or sumps. Multi-colored diagrams show operation of water and oil lubricated pumps. Sizes and capacities are charted. Fire pump accessories are diagramed in their proper assembly position.

Layne & Bowler, Inc.





### 184—Fire Hydrants

An AWWA compression type, dry head fire hydrant with swivel flange below nozzles, permitting nozzle section to be rotated 360° without removing bolts. Furnished with or without breakable flange and stem coupling. All parts removable thru inside of barrel. Bell, mechanical joint or flange pipe connections. R. D. Wood Co.

### FIRE PROTECTION EQUIPMENT continue



### 185-Fire Hydrants

Bulletin W-8879 describes Mueller's fire hydrants and gate valves. Photographs illustrate two and three way hydrants and each type of gate valve. Cutaway wash drawings show construction and operation. Precision engineered, these products meet the exacting specifications of AWWA. Specifications included. Mueller Co.



### 186-Remote Fire Alarm Systems

Bulletin A-1-857 describes how Autocall's remote fire alarm system connects the protected area with the fire station for positive continuous protection 24 hours a day. Fully supervised electrically, no false alarms, foolproof. Wiring diagrams. Approved by U.L. and F.M. Offices in principal cities. Autocall Co.

# **HEAT EXCHANGERS & WATER HEATERS**



### 187—Heat Exchangers

Bulletin 951 describes the C300 Heat Exchanger of U-tube design manufactured by American-Standard. Tube bundle is easily removable for cleaning. Design pressures and temperatures are charted. Material specifications of components given. Same data on C320 heat exchanger for tank suction heating.

American-Standard, Industrial Division



### 191-Multi-Zone Platocoil

Bulletin 159, 64 pages, completely describes new Multi-Zone Platecoil, covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Tranter Manufacturing Inc.



### 188—Shell and Tube Heating Units

Comprehensive new reference volume gives full data for quick, accurate sizing of instantaneous heaters, convertors and other shell and tube heating units. Over 500 pages, clearly indexed and tabbed for instant reference. Includes descriptive product data, typical installation diagrams, and dimension diagrams.

Richmond Engineering Co., Inc.



### 192—Heating Coils

Bulletin C-858 gives data for selection of coils for any cooling, heating, or heat pump application. This completely new selection guide contains selection tables, formulas, reference tables, charts, graphs, specifications, and dimensions. Concrete examples of selection formulas are given. Coils are UL approved.

Refrigeration Appliances, Inc.



### 189—Packaged Boiler-Burner Units

Bulletin describes packaged, vertical boiler/burner units for hot water supply or hot water heating. Available in 7 sizes, from 80,000 to 525,000 Btu/hr. Storage capacities from 22 to 123 gal, Oil and/or gas fired. Line drawings show construction and components. Complete dimensions and specifications in tabular form. S. T. Johnson Co.



### 193—Technical Platecoil Manual

Bulletin 356, is a concise, practical guide, helps busy people get fast answers to heat transfer problems. Comprehensive, vivid text with sketches, graphs, photographs, how-to-do-it examples. Includes U-values and other data. Illustrates kind, shape and size of *Panelcoil* for wide variety of applications.

Dean Products, Inc.



### 190-Tubular Heat Exchanger

Bulletin 40-112 describes the BS&B Uniflux direct fired tubular heat exchanger, giving complete design and operational advantages, principle of operation and applications. Uniflux provides a uniform heat flux around the process tubes without flame impingement and minimum flame extension. Diagrams.

Black, Sivalls & Bryson, Inc.



### 194—Heat Exchanger Tubes

Anaconda bulletin DM 6104 describes mechanical and physical properties and test results of new Cupro Nickel alloy specially developed for heat exchanger tubes in power plant feedwater heaters. This high-strength copper-nickel-iron tube alloy makes possible substantial operating economies. Sales offices listed. Anaconda Co.

# HEAT EXCHANGERS & WATER HEATERS continued



### 195—Heat Transfer Equipment

Bulletin describes the adaptability of Platecoil heat transfer equipment. Consists of two metal sheets, embossed and welded together to form passages for heating or cooling media. Can be specially built to meet requirements of shape, size, materials of construction and heating or cooling capacity. Platecoil Div., Tranter Mfg. Inc.



### 196-Heat Exchangers

Bulletin 451 describes American-Standard's C500 Exchanger for high fouling fluid and high thermal differential expansion. Charted are design temperatures and pressures. Materials components are made of are listed. Tube bundle is easily removable for cleaning, Design features. Diagram construction. American-Standard, Industrial Division.

# **HEATING & VENTILATING EQUIPMENT**



### 197-Ready-To-Run Fan Sets

Catalog 517 describes a new line of V-belt driven Ready Units. Features of construction and available special features are outlined. Selector charts indicating volumes to 25,000 cfm and static pressures to 2½ in. are shown in charts and graphs. Dimensions, capacities, shipping weights, and motor limits included. Clarage Fan Co.



### 201-Infra-Red Radiant Heaters

Bulletin PC 1-59 describes Panelbloc, the gas-fired infra-red radiant industrial and commercial heater. Brochure explains standard CR and CRH models. Brochure outlines the many advantages of infrared heating over conventional type. Includes data on construction and operation as well as complete specifications. Panelbloc Division, Bettcher Mfg. Corp.



### 198-Koof Exhausters

Catalog SL 1-60 illustrates and describes the Spun Line of centrifugal roof exhausters, for either sidewall or direct drive mounting. Describes unit construction, heavy wall tubing structure welded into a rigid one piece frame, spun aluminum housings, and weather shielded vibration isolations. Specifications.

Greenheck Fan & Ventilator Corp.



# 202—Gravity Ventilator Slide Rule

The Gravity Ventalog helps the engineer to properly size gravity roof ventilators and extruded aluminum louvre houses. All working information for rapid and accurate sizing of units, is integrated and is equivalent to six capacity tables, five pages of charts and ten mathematical formulas.

Penn Ventilator Co., Inc.



### 199—Power Roof Ventilators

Bulletin 680-C describes Sky-Blast power roof ventilators. Weatherproof features include corrosion-proof, aluminum alloy propeller; nonclogging dampers and rain-shed; one-piece all welded base hot-dip galvanized after fabrication. Automatic fire-vent release. Sizes to 60 inches; air deliveries to 78,000 cfm. Robbins & Myers, Inc.



### 203—Centrifugal Fans

Catalog 1120-1 describes Westinghouse's all purpose centrifugal fans, Series 3000. Suitable for many applications such as supply and exhaust, general ventilation, industrial air conditioning, tunnel ventilation, and industrial processing. Text is completely illustrated with photographs, charts, and graphs.

Westinghouse Electric Corp.



### 200-Duct Fans

Illustrated bulletin DB-761 describes De-Bothezat Bifurcator® fan with patented removable cone. Half-section of cone comes off as Bifurcator® remains in duct. Motor and fan assembly slides out on rails for quick inspection. Ideal for fume removal and induced draft. Bifurcator® installs like a section of ductwork.

DeBothezat Fans



### 204—Snap-On Baseboard Accessories

Catalog ADJ-1053 describes a new baseboard with a complete family of snapon accessories which cuts installation time. Factory-finished in semi-gloss appliance white. Control in each room provided by modulating damper. Elements and panels in factory-cut lengths. Crane Co.,

Plumbing-Heating-Air Conditioning.

### **HEATING & VENTILATING EQUIPMENT continued**



### 205-Variable Volume Reheat Units

Engineering bulletin P.E.-1-61 gives details, complete with illustrations, on Titus variable volume reheat unit. The unit is a new approach to providing better, more efficient, lower-cost heating, cooling and ventilating for perimeter areas of commercial and industrial buildings. Can be used with low or high pressure systems. Titus Manufacturing Corp.



### 211-Air Moving Device Test Code

Bulletin 210 explains the Standard Test Code for Moving Devices, issued by the Air Moving and Conditioning Association Inc. Covers scope, definitions, test set-up and equipment, observations, calcula-tions, and results. Includes tables, charts, graphs, and schematics. The purpose and major association activities outlined. Air Moving and Conditioning Ass'n Inc.



### 206-Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

Committee of Steel Pipe Producers, American Iron and Steel Institute.



### 212-Low Silhouette Roof Ventilators

Catalog, 1961 edition, describes complete line of high efficiency gravity and power roof ventilators. Complete engineering and performance data cover rotary, stationary, directional, continuous ridge, and unit ventilators in the gravity series. Powered models include horizontal and vertical discharge types.

Western Engineering & Mfg. Co.



### 207-Roof Ventilators

Illustrated bulletin DR-761 gives details of new DeBothezat Power-Flow Ventilator. Entire motor and fan unit tilts back above roof level to allow fast, easy inspection. Fan wheel diameters from 12" to 48". Capacities up to 43,070 cfm vertical discharge fans are available for re-moving oil and dust laden air.

DeBothezat Fans



### 213—Rehabilitating Heating Lines

Descriptive brochure illustrating procedures for restoring existing underground heat distribution systems to new construction efficiency. Before and after illustrations show metal conduit, split tile, concrete box, and hydrocarbon fill along with restoring procedures. List of rehabilitation jobs given.

Concrete Thermal Casings, Inc.



# 208-Air Supply And Exhaust Units

Bulletin 552 describes Clarage's Twinalator. Both air supply and exhaust are handled simultaneously with one impeller. Requires only one motor, one roof opening, one drive, one starter. No separate make-up air unit necessary. Dimensions, capacity tables, and diagrams included. Installations shown. Clarage Fan Co.



### 214-Infra-Red Heating Systems

Bulletin PE2-61 contains complete information necessary to lay out a Panelbloc infra-red heating system. Included, in addition to particular information on Panelbloc, is general U factors and other data useful in heating engineering. Average temperature of major cities as well as fuel consumption calculations.

Panelbloc Division, Bettcher Mfg. Corp.



### 209-Ventalog cfm Calculator

The Ventalog is a working tool to aid engineers in calculating the proper cfm requirement for any room area. In seconds, the Ventalog finds the cubic area air change chart, the cfm is quickly calculated. An excellent companion piece for the Penn catalog.

Penn Ventilator Co. Inc.



西西西西里 图

### 215-Belt-Driven Tubeaxial Fans

Bulletin 625, eight pages, describes Type BT and BTV tubeaxial fans in 30 to 60 inch sizes. Designed for handling high temperatures, corrosive and explosive fumes, abrasive dusts, dirt laden air, high humidity. Also lists general fan laws, data on system and open surface tank ventilation, and duct resistance.

Robbins & Myers, Inc., Propellair Div.



### 210-Modular Boilers

Bulletin VU-60-1 covers design, installation, and performance of the new type VU-60 boiler (100,000 to 250,000 lb/hr). Standardized components permit a wide range of boiler proportions for a given capacity, without the cost of custom engineering. Units produce high quality steam at all rates of output.

Combustion Engineering, Inc.



# 216—Heating and Ventilating Units

Catalog 46P, Q, RVIII describes Carrier's line of heating and ventilating units. Now offered in a wider coil selection and a greater design flexibility for commercial, institutional and industrial applications. Contains full descriptions, ratings and selection examples for steam and hot water systems.

Carrier Air Conditioning Co.

### HEATING & VENTILATING EQUIPMENT continued



### 217—School Heating and Ventilating

Four Fact Sheets, published by American Gas Association give case histories, school heating and ventilating installations. The project is described, requirements outlined, evaluation, and equipment selection. General specifications and cost figures are also included. Illustrations complete these case histories. American Gas Association



### 222-Unit System for Schools

Bulletin 600-A16 describes the Herman Nelson unit system of heating, ventilating, and air conditioning for school buildings. Illustrates unit ventilator construction and operation. Graphically shows air flow for heating and cooling. Cutaway shows construction and air flow through unit. Complete unit details. American Air Filter Co., Inc.



### 218-Direct-Connected Vaneaxial Fans

Bulletin 475 covers new Aerovent directconnected vaneaxial fans, equipped with removable vane sections to facilitate installation and simplify routine cleaning and maintenance. Furnished in sizes 18" to 48" for capacities to 67,300 cfm, these high-efficiency units offer top performance against resistances to 6" SP.

Aerovent Fan Co., Inc.

To order copies of the bulletins,

please fill out the card between

pages 6 and 7 or 54 and 55.



### 223—Hot Water Space Heating

Bulletin HY-F107 describes Hydrotherm's gas-fired hot water heating plants, for heavy duty space heating and large volume hot water supply, 360,000 to 3,600,000 Btu input. Contains construction and installation information. Includes load distribution figure, efficiency graph, and capacity charts. Specifications. Hydrotherm, Inc.



### 224—Surface Unit Heaters

Catalog 956 describes Grid cast from steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-pièce construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.



# 219—Airfoil Centrifugal Fans

Catalog 1125 describes Westinghouse's Centriline, Series 200, airfoil centrifugal fan with in-line air flow. Advantages and applications are outlined. Includes arrangements, sound comparison curves, and performance curves. Illustrations include cutaway showing construction features. Complete engineering data.

Westinghouse Electric Corp.



### 225-Exhaust Fans

Bulletin 1002 describes Norblo high and low speed exhaust fans. Used for dust collecting and air handling. Includes drawings of standard and special arrangements, dimension and capacity tables, friction chart, and test curves. Photographs show various arrangements and components. Drawings of installations. Northern Blower Div., Buell Engrg. Co.



### 220—Industrial Fans

Bulletin L-5 describes Lehigh's line of industrial fans. Includes tables, specifications, photographs, and drawings. Rating tables show air volumes, rpm, hp at static pressures, and outlet velocity and velocity pressures. Also correction ratios and fan laws.

Lehigh Fan & Blower Division, Fuller Company.



### 226-Air Distribution System

Bulletin issued by the Multi-Vent Division of the Pyle-National Company describes the Multi-Vent air distribution system, the finest in low velocity air diffusion. Diagrams show air flow in static, high capacity diffusion, and Multi-Vent diffusion rooms. Cost comparisons are shown in graphs.

Pyle-National Co., Multi-Vent Division.



### 221—Cast Iron Boilers

Catalog H-254 describes Weil-McLain's commercial and industrial gas, oil and combination gas/oil boilers. Net gas ratings to 3354 mbh (129.1 hp), net oil ratings to 2942 mbh (113.2 hp); ratings approved by Institute of Boiler & Radiator Manufacturers. Contains description, ratings, dimensions, and drawings. Weil-McLain Co.



# 227—Compact Centrifugal Ventilators

Bulletin CV61 describes and illustrates new high performance advanced styled, low silhouette, centrifugal roof ventilators featuring aerodynamically designed extruded aluminum discharge vanes, quietness of operation, non-overloading horsepower, and a stable pressure curve. Capacities certified by AMCA.

Western Engineering & Mfg. Co.

# **HEATING & VENTILATING EQUIPMENT continued**



### 228-Ventilating Sets

Catalog 1160 Westinghouse's ventilating sets, packaged fan units ready to use. Typical applications are listed. Includes features, construction, velocity charts, performance tables, typical specifica-tions, dimensions, and general applica-tion information. The units are illustrated together with component parts. Westinghouse Electric Corp.



### 231—Certified Performance Ratings

Bulletin 261A is an offical directory of products licensed to carry the AMCA Certified Ratings Seal and published by the Air Moving & Conditioning Association, Inc. Contains essential product identification data on more than 5000 centrifugal, axial and propeller fans, and power roof ventilators. Air Moving & Conditioning Ass'n Inc.



### 229-"Z" crete Insulating Conduit

Design Data Booklet C-6 describes the features of permanent thermal efficiency for underground heat distribution piping using "Z" crete and Insulating con-crete conduit. Includes construction sequence with diagrams, load study, typical conduit diagrams. Many other details are included.

Concrete Thermal Casings, Inc.



### 232—Aluminum Linear Diffusers

Catalog LTD-61 fully describes and gives complete selection data on Titus new line of extruded aluminum Staccato linear diffusers for sidewall, window sill, and floor. Diffusers feature louvers that are recessed at regular intervals spaced according to design desired. Available in a large variety of patterns. Titus Manufacturing Corp.



### 230-Propeller Air Movers

Eight page fully illustrated bulletin describes Greenheck propeller air movers, for either commercial or industrial installations. Includes construction features, dimensional data, electrical characteristics, and performance charts on Greenheck belted, direct drive, and economy line of air movers.

Greenheck Fan & Ventilator Corp.



### 233—Overhead Gas Heaters

Bulletin 400-4 describes Nesbitt's sealed flame, overhead gas heaters for use with natural, mixed, or manufactured gas. Two models, Radial-Flo and Down-Blo. Diagrams show flow. Cutaway shows construction and components. Complete specifications charted. Installation instructions accompanied by drawings. John J. Nesbitt, Inc.

# HIGHWAY, BRIDGE & STREET MATERIALS



# 234—Steel Highway Products

Catalog ADASW-6634 describes the various USS products for use in highways and streets. Products include welded wire fabric for cement and asphaltic concrete pavements, reinforced concrete pipe, prestressing wire and strand cable highway guard.

American Steel and Wire Division of United States Steel Corp.



# 236—Formulating Paving Aggregates

Bulletin HB 27, issued by the Paving Bureau of the Portland Cement Association, gives methods of determining the quantities of fine aggregate, coarse aggregate, cement, and water which will give necessary workability and required finished properties. Charts, graphs, tables, formulas, examples included.

Portland Cement Association.



### 235-Lighting Poles

Section B, Catalog 100, details steel, Section B, Catalog 100, details steel, cold-rolled aluminum and spun aluminum Monotube pole designs for roadway and off-roadway applications. Nearly 100 different pole and bracket designs described. Complete base, anchor bolt, accessory and modification details included. Engineering specifications. Union Metal Manufacturing Co.



### 237—Tapered Octagon Light Poles

Catalog 0-1860 describes continuous tapered steel and aluminum lighting standards for streets, highways, bridges, and area lighting. Contains 44 pages of drawings and complete specifications. Includes shaft covers, bases, overhead wiring, modifications, and accessories. Models pictured.

Kerrigan Iron Works Co.

# HIGHWAY, BRIDGES & STREET MATERIALS continued



### 238—Expansion Plates and Bushings

Manual 55-2 contains complete information, technical data, and specifications about self-lubricating expansion plates and bushings for bridges, buildings, refinery equipment, chemical processing equipment, high temperature, missile, and atomic energy applications. Fully illustrated with photographs and diagrams. Merriman Bros., Inc., Lubrite Division.



### 242-Traffic and Safety Equipment

This illustrated brochure describes Planet's new line of highway traffic and safety equipment. Included are overhead sign trusses, roadside directional signs, bridge railings, and pedestrian overpasses. Planet's highway products are illustrated and described in text. Engineered systems and automation equipment.

Planet Corp.



### 239—Reinforced Concrete Pavement

Bulletin II, "Design of Continuously Reinforced Concrete Pavement for Industrial Driveways", suggests designs, details, and specifications for materials and construction. Based on the set of design charts available in Bulletin I. Includes suggested end anchors and details peculiar to industrial driveways.

Concrete Reinforcing Steel Institute



### 243—Cast Aluminum Post Lights

Folio 41 describes new 4-200, 4-300 series post lights by mcPhilben, featuring sturdy all aluminum construction, anodized finishes, and weatherproof bugtight operation. For walkaways, paths, driveways, parking areas, schools, campuses, hospitals, shopping centers, housing developments and public buildings. mcPhilben Lighting Co., Inc.



### 240—Safe Slip-Proof Surfaces

Bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Methods of application. Can also be used with epoxy resins to cover existing surfaces. Samples in plastic containers included.

Exolon Co.



### 244—Concrete Pavement Manual

Manual R2 contains material that will help build better concrete roads and streets. The manual discusses design and construction curves, grades, thicknesses, joints, reinforcement, alleys, curbs, crown, drainage, resurfacing, concrete bases, colored concrete, traffic markers, sidewalks. Tables, photographs. Portland Cement Association.



### 241—Highway Guard Rail

Catalog FB-3461 describes Armco's Flex-Beam guardrail for safer highways. The requirements of good guardrail are outlined. Tables show available coatings and weights for lengths of various gages. Drawings show installation and details of components. Dimensions and physical properties. Photographs of installations. Armco Drainage & Metal Products, Inc.



### 245-Lighting Standards

Loose-leaf binder contains all seven of Kerrigan's lighting standard equipment catalogs. Covers street, highway, and area lighting standards as well as structures for signaling and highway signing. Each type of standard is illustrated and complete dimensional data given. Exploded views and erection details. Kerrigan Iron Works Co.

# INDUSTRIAL PROCESSING EQUIPMENT



# 246-High Speed Dryer

Bulletin K-156 explains low-humidity principle of high-speed, continuous dryer for products which can be damaged by temperatures above 120°F. Contains description of process, case history, flow diagram. Describes pilot testing services. Sales engineering offices throughout the country are listed.

Surface Combustion.



# 247—Process Piping

Bulletin describes line of process piping and the facilities available for manufacturing piping systems at Kellogg. Shop fabricated systems for petroleum, petrochemical, pulp and paper, food, and nuclear power industries. Various operations in custom-built piping systems are pictured. Installations. M. W. Kellogg Co.

# INDUSTRIAL PROCESSING EQUIPMENT continued



### 248-Grinding Mills

Grinding Mill Specification Manual B2-B34 containing a slide-rule for estimating ball mill size, detailed specifications for mills to 10' diameter, drawings, di-mensions, foundation drawings. Includes tables of mill speeds, grindabilty of ores, engineering data, and comparisons of mill columes.

Denver Equipment Co.



### 252-Hot Water Boiler

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.

Combustion Engineering, Inc.



### 249-Vibration Mounts

Bulletin describes, illustrates, and diagrams Rexon Mount Vibration Isolaters employing principle of rubber-in-shear to control vibration and sound of working machinery. Engineering details, performance data, and computation tables enable anyone to properly order and install these Mounts

Hamilton Kent Manufacturing Co.



### 253-Air Conditioning and Drying

Bulletin K-160 describes the latest model (Model C) Kathabar Air Conditioning and Drying Systems. The equipment is used to stop condensation; speed drying and other processing operations; obtain sub-freezing dew-points; make air sterile to hospital standards. Multicolor diagram shows operation. Fully illustrated. Surface Combustion.



### 250—Glass Lined Process Equipment

Bulletin MG 105 describes A. O. Smith's Glascote products for the chemical processing industry. Includes such products as reactors, storage tanks, columns, con-ical rotary dryers and blenders, condensers, heat exchangers, and others. Complete specifications include dimensional drawings. Sales offices listed.

A. O. Smith Corp.



# To order copies of the bulletins, please fill out the card between pages 6 and 7 or 54 and 55.



### 251-Ball-Type Flexible Struts

Catalog 229A describes Barco's ball type lexible struts for refineries, power plants, chemical plants, paper mills, steel plants, and steam and processing piping. Cutaway photographs show construction and diagraps show discounter Leaded diagrams show dimensions. Included are engineering applications, advantages, capacities, and general specifications. Barco Manufacturing Co.

### 254-Wet Scrubbers

Two radical designs in wet scrubbers, and other process industries, are presented in the Aerotec chemical equipment brochure. It also illustrates and describes centrifugal dry gas scrubbers along with other Aerotec dust and fume control equipment used in processing. Aerotec Industries, Inc.

# INSTRUMENTS, CONTROLS and GAUGES



### 255-Data Centers

Engineering technical bulletin 74-1301 provides adata on Selectographic Supervisory Data Center and its application as central control console in large and medium sized building, and building complexes. Includes functions, wiring diagrams, trunk wiring anaylsis, wire sizing and installation information.

Minneapolis-Honeywell Regulator Co.



### 256-Solenoid Valves

A new condensed valve bulletin 8264, supplement to catalog numbers 25 and 202 contains 16 pages describing recently developed ASCO 2, 3 and 4 Way Solenoid Valves. It illustrates and describes each valve, giving features, operation, applications, list prices, dimensions, flow diagrams and weights.

Automatic Switch Co.



### 257—Burner Light-Off Systems

Bulletin 760-1 describes Bailey's 760 burner light-off systems for gas and/or oil fuel. A simplified diagrammatic of the system is shown. Photographs show system cabinets and typical component arrangement for 12 gas burners. Diagram for burner control operating sequence. Components described.

Bailey Meter Co.



### 2A3-Differential Pressure Switches

Bulletin E-40 describes Dwyer's new model No. 1800 differential pressure switches, capable of very sensitive actuation. Gives application characteristics, complete specifications, and ordering instructions. Operating instructions include operation, installation procedures, and adjustments. Complete parts list.

F. W. Dwyer Manufacturing Co.



### 258—Inkless Chart Recorder

Bulletin 3057A describes Edison's Omnicorder, the inkless, circular chart re-corder smaller than an ordinary panel meter. Outlines features, operation, construction, specifications, dimensions, and lists accessories. Text is illustrated with photographs and line drawings. Ordering information included.

Thomas A. Edison Industries.



### 264-Liquid Level Controls

Bulletin F-4A describes Fisher displacement type pneumatic proportional and two-position liquid level controllers in iron, steel, or alloy constructions for pressures up to 2500 psi. Models also available for specific gravity and interface level control applications and as indicators and transmitters.

Fisher Governor Co.



### 259—Desk Thermostats

Execustat, a new type desk thermostat ronment, is featured in circular 382A. A handsome addition to an executive's desk, it can be easily connected to any type of control system. Unlike wallmounted thermostats, is easily relocated.



designed for precise temperature con-trol of the individual's immediate envi-Powers Regulator Co.



### 265—Boiler and Tank Controls

Bulletin describes Reliance's versatile EA101 Levalarm®. Economical control for boilers and tanks in power plants and process departments. Applications given. The Levalarm® is illustrated along with schematics showing construction. Over-all dimensions are included. Capacities in steam and tank service included. Reliance Gauge Column Co.



# 260-Annunciator Nameplates

Bulletin sheet describes new Magna-Plac nameplate now available as a no-charge option on Scam De-Line annunciators. New, larger nameplate provides 70% more engraving area; 50% more characters per nameplate, without increasing over-all size of annunciator. For fully descriptive, visible trouble legends. Scam Instrument Corp.



### 266—Pressure Regulators

Bulletin 1011 describes Spence's pressure regulators, one pilot fitting main valve sizes. Selection data telling how to choose the appropriate pilot and main valve is illustrated with cutaways. Recommended steam capacity table, flow in pounds per hour, included. Diagrams show arrangements. Spence Engineering Co., Inc.



### 261-Detector Specifying Guide

Specification Guide for Holiday electrical inspection in handy folder form contains information on types of detectors, inspection methods, and techniques. The guide includes other material to aid consulting engineers in obtaining adequate inspection of coating systems. Detectors are illustrated.

Tinker and Rasor.



# 267—Continuous Automatic Weighing

Catalog 14, revised, describes automatic weighing for continuously maintaining uniform flow rates of solids and liquids used in processing and formulating bulk materials. Different types of equipment described and illustrated. Details the use of unitized components to reduce costs of job-engineered systems.

Weighing & Controls, Inc.



### 262—Liquid Waste Flow Meter

Bulletin 28 describes the Stevens Model 60M total flow meter. A completely new instrument designed to meet the need for low-cost yet is accurate and dependable. Instrument for measuring the flow of sewage, industrial wastes, or other liquids in open channels. Portability and versatility are featured. Leupold & Stevens Instruments, Inc.



# 268—Tank Contents Gaging Systems

Suggested specifications for tank con-Suggested specifications for tank contents gaging systems – hydraulic, hydrostatic, and direct reading – are given in bulletin 463A. Model selection guides and pictorial diagrams are included, along with a list of liquids successfully gaged by Liquidometer systems, and principles of operation of each gage. Liquidometer Corp.



### 269—Dimmer Lighting Controls

Catalog E/A describes a versatile line of lighting controls for schools, churches, and clubs, utilizing adjustable autotransformer type dimmers rated from 1.2 to 8 kw each. Complete specifications, as well as wiring diagrams, are included for all types of dimmers offered. Looseleaf catalog contain price lists.

Ward Leonard Electric Co.



### 275-Flow Controls

Data Sheet 81-71 describes Magnetrol's FCV Series flow controls, for positive physical fluid flow control with reliable flow annunciation. Extreme flexibility allows wide rang of applications. Operating principle is diagramed. Specifications are included. Complete list of distributors given.

Magnetrol, Inc.



### 270—Controls and Regulators

Bulletin C-50 describes McAlear's line of equipment for the control and regulation of steam, water, air, oil, and gas. Controls are illustrated with cutaways showing construction and operation. Specifications necessary for specifying are included. Sizes of various models are given.

McAlear Manufacturing Co.



### 276—Vapor Tension Thermometers

Catalog 76-T describes the Marsh line of rigid stem and distant reading vapor tension thermometers furnishing fahrenheit and centigrade ranges. Illustrates the wide selection of case patterns and standard dials available. All data necessary for accurate specifications. Also covers piping and duct thermometers.

Marsh Instrument Co.



### 271—Temperature Controls

Bulletin O-28 describes Mercoid's new temperature control for refrigeration, air conditioning, and various industrial applications. Construction information is accompanied by cutaway photograph. Dimensional line drawing. Chart shows operating ranges and list prices. Complete bulb specifications included. Mercoid Corp.



### 277-Manometers for Plant and Lab

Catalog 2008 covers U-type, single- and multi-tube well-type, and inclined-tube Manometers, for measuring pressure vacuum, flow; draft gauges; indicating liquids; accessories. Explains operating principle and inherent accuracy. Discusses points to consider in selecting Manometers for specific applications.

King Engineering Corp.



### 272—Multiple Metering Equipment

Bulletin 9001-1A describes I-T-E's complete line of multiple metering equip-ment. All types are illustrated. Dimen-sions are given — diagrams. Informa-tion necessary for selection is in tabular form. Various layouts are shown, Installation drawings for complete line. Schematics show construction.

I-T-E Circuit Breaker Co., Walker Div.



### 278-Water Flow Instruments

Miniature Strip Chart Instrument for complete and accurate indication, totalization and recording of fluid flows. Provides same functions as larger instruments; requires less panel space. Bulletin 330 shows working mechanism, chart capacities, installation specifications.

Sparling Equipment Hersey-Sparling Meter Co.



### 273-Motor Controls

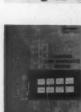
Entirely new motor control development is described in booklet 14B9739. Among the engineering "firsts" described are two-high control center construction, complete drawout design, roll-out contactor, and flame-retardent. Track-re-sistant insulation used throughout. Engineering advancements fully described. Allis-Chalmers.



### 279—Automatic Temperature Controls

Condensed Catalog 27 describes and illustrates the 1961 line of Barber-Colman temperature and humidity controls. Valve selection data is included for easy reference. Featured is an entire new line of room thermostats in single and duplex models for electrical ratings up to % horsepower.

Barber-Colman Co.



### 274—Industrial Lamp Annunciators

Bulletin A-200 describes Edwards' new line of industrial lamp annunciators, which indicate visibly and audibly any abnormal condition in an automated or process system, Line features modular plug-in circuits and data logging or auxiliary control terminals. Includes selector chart, dimensions, components. Edwards Co., Inc.

### 280—Remote Time Controls

"On/Off is Out" booklet describes the RC6000 electronic or wired remote time control for utility functions, clocks and audible signals. Lists areas of savings and typical applications for programmed and manual operation of heat, light, ventilation, air conditioning, and sanitation from one central point.

Stromberg Division, General Time Corp.



### 281-Warehouse Scales

Bulletin 8003 describes self-contained warehouse scales designed to meet your specifications. For factories, warehouses, shipping and receiving rooms, foundries, and paper mills. Various models are illustrated. Specifications are tabulated. Drawings show dimensions. Other technical data is included.

Fairbanks, Morse & Co.



### 287—Control Catalog

Catalog GEC-1260D describes General Electric's complete line of general pur-pose control, in addition to pricing and application data, and guide form specifications, the new catalog contains a horsepower selection chart which simplifies choosing control for motors ranging from ¼ to 200 hp. General Electric Co.



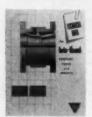
### 282-Propeller-Type Meters

Bulletin 315 illustrates and provides specifications for the complete line of Sparling propeller-type main-line meters, recording instruments, and control equipment. Various applications, flow ranges, sizes, cut-away drawings, and installation information are all included. Pictured are production and test equipment. Hersey-Sparling Meter Co.



### 288-Turbine Flow Meter

Brochure SP-11008 describes flow mebrochure SP-11008 describes now me-ters and auxiliary equipment for in-line fluid flow indication, recording, telemetering, or control in chemical, petrochemical, refinery, pipe line, gathering line, food processing, LPG and any other fluid flow metering and control system. Long-life accuracy. Halliburton Co.



### 283-Venturi Tubes and Inserts

Comprehensive technical bulletin 1021 describes Infilco's Twin Throat Venturi tubes and inserts, which are offered in a wide range of sizes. Discusses the lower head loss and shorter laying length of this type of measuring device. Contains capacity tables, capacity and line velocity charts, specifications and dimensions. Infilco Inc.



### 289-Electric Heat Thermostat Manual

Bulletin describes Mears' line of controls for electric heat and air conditioning, in wall mount and inbuilt models. Also describes water heat thermostats and load regulators. Includes heat tube selection dimensional diagrams, wiring diagrams, and Knob rotation charts. Lists Mears representatives in this country. Mears Controls, Inc.



### 284—Precision Control Valves

Catalog A243 describes all types of precision control valves manufactured by the Kohler Co. Cutaways and exploded views show construction and operation of various types of valves. Sizes and engineering data in table form is included. The many valve applications are listed. Branch sales office addresses given. Kohler Co.



### 290-Control Panels

Bulletin G-9 describes modern graphic panels for automatic handling of dry materials and process equipment control. Panels are designed and fabricated by manufacturer and are internally wired. Wiring diagram is furnished and supervision is normally furnished for start-up of system. Illustrated. Fuller Co.



# 285—Liquid Level Indicators

New Yarway Bulletin RI-1825 describes remote liquid level indicators for pres-sures to 700 psi. Includes design features, how it works, how it is connected, specifying and ordering information, as well as typical applications on boilers, tanks, and other equipment. Completely illustrated.

Yarnall-Waring Co.



# 291—Constant Weight Feeder

Bulletin AH-509 shows latest development in the Hardinge constant weight feeder. A change in design has been made to the frame to improve belt replacement facility. A demountable belt assembly is now offered on several models. Line drawings show operation, Photographs show components.

Hardinge Co., Inc.



### 286—Pressure Regulators

Bulletin SM71 describes advantages of Bulletin SMT1 describes advantages of three recently introduced pressure regu-lators. Accurate, external pilot operated Type D is included along with balance and direct acting types. Specification details, application data, and list prices are given, as are capacity charts and operating procedures.

STRONG.



### 292-Differential Pressure Switches

Bulletin E-30 describes Dwyer's new model No. 1630 differential pressure switches. Includes application characteristics, ordering instructions, and com-plete specifications. Gives lead wire color codes to pilot lights together with rated life. Installation procedures, adjustment, and mounting template.

F. W. Dwyer Manufacturing Co.



### 293—Classroom Ventilator Guide

Bulletin 77-2301 contains engineering data to help the consulting engineer select the proper control cycle in installations of standard, valve controlled classroom unit ventilators. Includes hot water system and steam system design considerations. Show wiring diagrams of day and day-night cycle control.

Minneapolis-Honeywell Regulator Co.



### 299-Electric Control Systems

Bulletin E74-1 describes the Bailey 720 electric control systems. General block diagram is shown. Specific functions and signal range completely outlined. Various components are illustrated and described. Includes measuring signal initiators, control signal manipulators, and power units. Auxiliary devices described.

Bailey Meter Co.



### 294—Float Operated Alarms

Sec. AO of catalog 500 describes water columns with float-operated alarms for pressures from 0 to 250 psi. Cutaway views show construction and operation. Advantages with reference to additional detailed literature. Various operations at Reliance plant are pictured. Installations are shown.

Reliance Gauge Column Co.



### 300—Thermostatic Water Control

Folder features new Hydroguard Safety Set for safe, convenient bathing. Includes thermostatic water control, shower head with arm and flange, tub spout and diverter tee. Thermostatic control is available separately. Positively prevents scalding even at full hot. For institutions and hotels.

Powers Regulator Co.



### 295-Monitoring Systems

Bulletin 1058 describes Scammit monitoring systems employing completely self-contained static switching components to eliminate component failure. Describes long system life, low initial cost, easy installation, and freedom of maintenance. Illustrates basic models and gives applications. Dimensions.

Scam Instrument Corp.



### 301-Level Controls

Bulletin JH2674 describes Weighing and Controls' Prob-A-Larms, the practical, low cost method of detecting and controlling quantities and levels of liquids, powders, and grains. Typical applica-tions are diagramed. Various models are illustrated and dimensions are included. Specifications and ordering data.

Weighing & Controls, Inc.



### 296-Buried Pipe Detector

Bulletin describes Detectron "505", compact, lightweight electronic unit that tells exact location and depth of buried pipes, valves, stubs, manhole covers, services, cables, other metallic objects. Low cost way to avoid damage to unknown lines when excavating, drilling. Locked in tuning, shielded loops.

Detectron, Division of Tinker & Rasor.



### 302—Specifying Driver Recorder

Form 632 is a specification guide especially designed in handy folder form to assist consulting engineers to specify their choice of tank contents gaging systems for each project. Contains sample specifications for hydraulic system, and hydrostatic systems (manually operated and continuous reading).

Liquidometer Corp.



### 297—Pressure Controls

Bulletin O19A describes Mercoid's Series D pressure controls with bourdon tube and pressure connection of 316 stainless steel. Operating chart includes operating ranges, adjustment, differentials, and electrical ratings. Prices are given on all models. Accessories are listed and il-lustrated. Various models pictured. Mercoid Corp.



### 303-Weight Driven Recorder

Bulletin 24, eleventh edition, describes the recently re-designed Type F Stevens recorder. Contains eight pages of illustrations and descriptive data. Applications data with information describing the new field-interchangeable clock drive is included. Also described is the Stevens Type FM weight driven recorder.

Leupold & Stevens Instruments, Inc.



### 298—Control Valves

Bulletin E-600 fully describes Fisher pneumatic diaphragm and piston actua-tors, and a wide variety of valve body assemblies. A 20-page specifying section contains the information necessary for selecting a control valve. Accessories, such as valve positioners, handwheels, and transducers are included.

Fisher Governor Co.



### 304—Indicating and Alarm Systems

Bulletin 3036C describes in detail the Edison Omniguard indicating and alarm system. A reliable low-cost temperature detection for small or large installations. Features, operation, specifications, connections, wiring diagram, and installa-tion procedures are given. Various types are pictured and described.

Thomas A. Edison Industries.



### 305—Remote Lighting Controls

Catalog SOL-1 describes Solitrol, a new concept in remote lighting controls for theatres, TV studios, auditoriums, and schools. Shows elaborate unlimited "800" series and simple "100" series remote control station. Comprehensive flow chart shows operation. Simple finger control to elaborate panelboard control. Ward Leonard Electric Co.



### 306—Refrigerant Level Controls

Catalog Section 10 describes Magnetrol's Model R-273 refrigerant level control for industrial and commercial systems. Complete dimensional data. Cutaway shows construction and components. Operating principle is explained and diagramed. Features are outlined and engineering specifications given.

Magnetrol, Inc.



### 307—Solenoid Valve Catalog

Bulletin 506 new stock and selection guide lists the world's largest stock of solenoid valves for immediate delivery. Easy to select valve suited for your application. Valves are grouped under specific types — 2-way normally closed, 2-way normally open; 3-way; 4-way; manual reset and special purpose. Automatic Switch Co.



### 308—Temperature Controls

Bulletin 1014 presents a complete selection of temperature controls. Includes selection data for main valves and temperature pilots. Charts show flow in lb of steam per hour, gph of water heated 100°F rise, and main valve dimensions and weights. Cutaways, schematics, and graphs included.

Spence Engineering Co., Inc.



### 309—Pressure Reducing Regulator

Bulletin 175 describes McAlear's pilot operated pressure reducing regulator for accurate regulation of steam, air, or gas pressure. Cutaway and diagram show construction and points out components. Sizing chart gives psph for all sizes. Dimensions and list prices are tabulated. Complete specifications.

McAlear Manufacturing Co.



### 310—Complete Line of Gauges

Catalog 76-G contains descriptive information on the broad Marsh line of gauges. Evaluates exclusive Marsh features; illustrates choice of easy reading dials and case patterns. Cites standard gauges for specific applications. Also covers solenoid and needle valves often used on applications requiring gauges. Marsh Instrument Co.

# INSULATION & PROTECTIVE COATINGS



### 311—Heat and Cold Insulations

Bulletin A-416 contains information on Baldwin-Ehret-Hill's complete line of heat and cold insulations for service from sub-Zero to 2000°F. Temperature guide/graph shows proper insulation for varying temperatures. Complete specifications are given on each type of B-E-H insulation. Installation pictures. Baldwin-Ehret-Hill, Inc.



### 313—Gilsulate Applications

Illustrated booklet S-88 gives the complete story of Gilsulate; what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating valves. Also tells of the organization in back of Gilsulate—checking of piping layouts and soil conditions and supervision of installations. American Gilsonite Co.



### 312-Pipe Protection Tape

Bulletin introduces Tapecoat 20, an improved, hot-applied, pliable coal-tar coating in tape form, gauged for thickness. Includes polyester film outer wrapper. Designed for single-thickness application with minimum overlap. Easy to apply on pipe, joints and fittings, conduit, cable, insulated pipe, tie rods.

Tapecoat Co.



### 314—Insulation Protection

Bulletin issued by Benjamin Foster Co. tells how the use of their product will meet your insulation protection requirements. Reference chart gives product, description, method of application, coverage, service temperature, flame spread, color, bonding time, and drying time. Mastics, adhesives, coatings sealers. Benjamin Foster Co.

# INSULATION & PROTECTIVE COATINGS continued



### 315-Snap-On Pipe Insulation

"G-B Snap-On Pipe Insulation," eightpage booklet, describes characteristics and application data for one piece, fine-glass pipe insulation. Application specifi-cations cover plumbing, heating, insula-tion of valves and fittings, cold piping, dual temperature, and outdoor piping. Thickness charts are also included. Gustin-Bacon Manufacturing Co.



### 319—Insulating Cement

Bulletin describes Baldwin-Ehret-Hill's \$1 Plus insulating cement with tested thermal efficiency up to 2100°F. Sticks to any surface, quick and easy to apply can be stored for extended periods are some of the advantages of this new product. Low thermal conductivity shown in graph. Sales offices listed. Baldwin-Ehret-Hill, Inc.



### 316—Styrofoam Pipe Vessel Covering

Bulletin 157-57 describes Styrofoam for superior low temperature pipe insula-tion. Engineering data includes physical and thermal properties, water resistance, and vapor transmission. Specifications for various types of applications are illustrated. Thickness standards and recommended thicknesses. Dow Chemical Co.



### 320—Coal-Tar Protective Tape

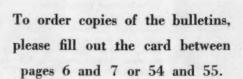
Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection equivalent to a hot-applied coal-tar pipeline coating. Tapecoat Co.



### 317—Pipe Insulation News

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes use of Gilsulate by Caterpillar Tractor Co., gives a report on Gilsulate efficiency, and instructions for tamping the Gilsulate bed. Illustrated.

American Gilsonite Co.





# 318—Glass Fiber Insulation

Bulletin ULHT 360 describes Ultralite, Gustin-Bacon's rugged glass fiber insulation. Gives comparison of Btu losses, uninsulated versus insulated tanks. Includes features, examples, graphs, and application photographs. Complete details, line drawings, and photographs on two methods of insulating tanks.

Gustin-Bacon Mfg. Co.



### 321—Protection for Chimneys

Bulletin describes Stakfas designed ex-clusively to resist acid corrosion from high sulfur fuels, a protection for brick, steel, and concrete chimneys. Tables give evaluation of heat resistance and elasticity and acid resistance. Typical Stackfas applications in diagram. Application methods described. Specifications. Benjamin Foster Co.

# LIGHTING FIXTURES & ACCESSORIES



### 322-Fluorescent Lighting Fixtures

Bulletin A84a presents complete photometric and installation details pertain-ing to Sculpturama fluorescent lighting fixture. Describes the improved characteristics of the polystyrene plastic used in the diffusers for these fixtures. A wide variety of lighting possibilities is shown. Completely illustrated.

Sunbeam Lighting Co.



### 323-Mercury Lamp Transformers

Bulletin BMV-430, Buyer's Guide containing complete listings of mercury lamp transformers. Includes outline dimensions for housings. Complete specifications in tabular form for indoor and outdoor service. Accessories and adapters are diagrammed and include dimensions. Wiring diagrams for circuits.

Sola Electric Co.

### LIGHTING FIXTURES & ACCESSORIES continued



### 324—Recessed Incandescent Lighting

Careful attention to details of design and engineering is combined with highest quality construction materials in Litecraft's Endura series, Fixtures are built to fit so precisely into the ceiling they become an integral part of it. Catalog Section K gives all details, including cross-sectional drawings.

Litecraft Manufacturing Corp.



### 330-Fluorescent Lighting

Bulletin V-133 describes Sylvania's HQ Series commercial fluorescent lighting fixtures. Complete specifications given. CIE distribution, photometric efficency, maintenance factors, weights and wattages, brightness values, and coefficents of utilization are tabulated. Dimension details diagramed.

Sylvania Electric Products Inc.



### 325—Relighting Classrooms

Smoot-Holman Perfect Vision square systems for relighting classrooms, using existing circuits, are detailed in four page color brochure. Four basic systems with power requirements outlined. Light levels for various school tasks listed. Cost comparison made with this system and incandescent classroom lighting. Smoot-Holman Co.



### 331—Lighting Fixtures

Bulletin 32 describes Lightolier's surface and pendant Coronet and Corona fluorescent lighting fixtures. Size range is shown. Diagramed is complete dimensional and installation data, candle-power distribution, and calculator which determines the number and spacing of units for any desired level of illumination. Lightolier, Inc.



### 326-Flexible Lighting Busway

Bulletin GEA 6170A describes GE's LTG 50 ampere-300 volt-2, 3 and 4-pole busway. Shows flexibility as power source for lighting fixture application, including display lighting and small power tools, machines and business equipment. Components, accessories, dimensions.

General Electric Co.

Distribution Assemblies Dept.



### 332-Aluminum Post Luminaires

Catalog LTG-31 describes Pfaff & Kendall's Circleux luminaires. Packaged unit consisting of tapered aluminum post with a luminaire to match. Photometric data for fluorescent, mercury vapor, and incandescent includes graphs showing candle power distribution. Exploded views show arrangements.

Pfaff & Kendall



### 327—Emergency Lighting Handbook

The purpose of this bound handbook is to make available to consulting engineers all pertinent information on 6-voil emergency lighting. Gives reasons, installation design, equipment, components of system, and maintenance. Specifications, National Electrical Code, Building Exits Code, and State Regulations. Electric Cord Co.



### 333—Surface Mounted Fixtures

Bulletin OD-1056 describes Day-Brite's Tiara, the surface-mounted fluorescent lighting fixture for stores, offices, schools, and other applications. Possible design patterns diagramed. Installation information is illustrated with drawings. Fixture spacing and photometric data aid in selection. Representatives listed.

Day-Brite Lighting, Inc.



# 328—Combination Fixtures

Bulletin describes the Ventro-Lux fixture manufactured by Curtis-AllBrite. Provides light, heat, cooling, and ventilation in the one troffer. It cools, heats, and ventilates more quickly, more effectively, and more completely. Cutaway shows construction and operating principle. Specifications and dimensional data. Curtis-AllBrite Lighting Inc.



### 334—Industrial Fluorescent Lighting

Bulletin F describes the newly designed and expanded line of industrial fluorescent lighting fixtures offered by the Benjamin Division of Thomas Industries Inc. Catalog includes detailed illustrations and complete specifications covering all elements of the line. The many features of this new line are explained. Thomas Industries Inc., Benjamin Div.



### 329-Ballast Buyers' Guide

Advance Transformer Co.

Bulletin ATC 112 is a fluorescent lamp ballast buyer's guide, effective August 14, 1961. Gives list of obsolete Advance ballasts with suggested replacements. Includes electrical data, physical dimensions, packaging, and list prices. Wiring diagrams for all situations. Conditions of sale and ordering data. Liver Helphine Issue

### 335—Flood Lighting Equipment

User Net Price List 61-320, describes the full line of Westinghouse flood lighting equipment. The bulletin is illustrated with a photograph of each unit, provides a general description of the unit, construction and lamp details, ordering information, shipping weights, and suggested net user prices. Accessories listed. Westinghouse Electric Corp.

### LIGHTING FIXTURES & ACCESSORIES continued



### 336-Fluorescent Luminaires

Wakefield Lighting Division catalog describes the complete line of recessed and surface fluorescent luminaires, designed to meet specifications for all types of commercial and industrial installations. Tab indexed catalog gives complete engineering data. Wiring diagrams and dimensions.

Wakefield Lighting Div., Wakefield Corp.



### 342—Troffers and Brackets

Guth File 3 consists of 10 pages describing various types of wide recess troffers. Data includes models and installation, type of diffuser, construction, finish, wiring, and lighting data. Photographs show various models and line drawings show dimensions. Swing mounting brackets simplify installation. Edwin F. Guth Co.



### 337—Indoor Luminaire Maintenance

Safe low-cost floor-level servicing of high-bay luminaires is described and illustrated in bulletin TH-57. The five basic requirements for a Thompson hanger installation, available hanger models, accessories, Underwriters' ratings, and range of applications also are outlined in detail. Illustrated.

Thompson Electric Co.



### 343—Sports Lighting Design Manual

Design Book B-5872-A gives basic information on the design and selection of proper equipment for sports applications. Applications described range from practice putting greens to major football stadiums. Includes lamp data, mounting heights, and pole types. Lighting layouts, transformers, and wire selection. Westinghouse Electric Corp.



### 338—Fluorescent Lamp Ballasts

GEC-983 gives full information, including prices and electrical data, for a complete line of fluorescent ballasts. Covered are rapid-start, instant-start, pre-heat-start, dimming, outdoor, plastic sign, and weather-proof ballasts. Data on new Bonus Line ballasts. Wiring diagrams, dimensions, and installation data. General Electric Co.



### 344—Emergency Lighting

Technical handbook 61.01 describes Exide's line of automatic battery-powered emergency lighting equipment. This is a valuable reference for consulting engineers who plan lighting installations. Gives complete engineering descriptions of equipment, illumination times and intensities, methods of installation.

Exide Industrial Marketing Division.



### 339-Quartz-Lodine Lamps

Bulletin 1103-61 describes Quartzliters Series 7000 for 500 and 1500 watt Quartz-Lodine lamps, wide, medium, and narrow beam. Typical applications listed, Lamp data given. Optional mountings diagramed. Quartzliter photometric data for narrow, medium, and wide beam in 500 and 1500 watt models. Pule-National Co., Steber Division.



### 345—Lighting Technical Data

Catalog 79 covers current designs in lighting with complete technical data. Distribution curves show foot-candle intensities on vertical as well as horizontal surfaces. Special sections cover industrial and office applications; also residential and institutional use including schools and hospitals.

Kirlin Co.



### 340—Special Purpose Lighting Units

Folio 61-1, a 12 page booklet, describes mcPhilben's unique line of cast aluminum special purpose lighting units. Applications for vaportight, exterior, general interior use and directional signs. Includes specifications, drawings, and optional features to assist you in selection of quality lighting.

mcPhilben Lighting, Inc.



### 346—Area Floodlighting

Bulletin 2719 is a comprehensive booklet giving data on area floodlighting using Mercury or incandescent lamps. Tables give number of floodlights required, type of equipment, and layouts. Specifications include cutaways and line drawings. Foot-candle charts, mounting accessories, and installation suggestions. Crouse-Hinds Co.



### 341-Lighting Duct

Bulletin ULD-660 describes BullDog's Universal lighting duct. Presents pictorially the components of this flexible lighting system which suspends and electrically energizes lighting fixtures and small power tools. Lists various types of duct, suspension equipment, and fittings.

BullDog Electric Products Division I-T-E Circuit Breaker Co.



### 347—Lighting Design Data

Concise yet thorough coverage of lighting terms, formulae and design factors makes Bulletin VE-900 an ideal reference book and design guide. Area lighting systems are covered for both panel and louver type ceilings. On the back page is a listing of current recommended illumination levels for many applications. Sylvania Electric Products Inc.

### LIGHTING FIXTURES & ACCESSORIES continued



#### 348—Sealed Beam Fixtures

Catalog Section 15 lists sealed beam fixtures, mushroom island lights, louver lights, weather-proof fixtures, surface mounted yard lights and farm yard lights. Models, as well as accessories necessary for installation, illustrated. Exploded views show arrangement of components. Complete specifications. Killark Electric Manufacturing Co.



#### 353-Ballast Cross Reference Guide

A fluorescent lamp ballast cross reference guide published by the Advance Transformer Company. Gives obsolete Advance ballasts catalog numbers along with suggested replacements. Also shows catalog numbers of ballasts manufactured by other companies and gives Advanced catalog numbers for suggested replacements. Advance Transformer Co.



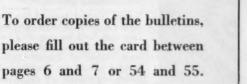
#### 349-Floodlighting

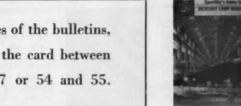
Section C, Catalog 100, offers complete design data and engineering specifications for steel and aluminum Monotube floodlighting and area lighting poles. ring mounting type, square and round hinged types. Floodlight mounting ar-rangement details also included Union Metal Manufacturing Co.



#### 354—Efficient Fluorescent Lamps

Bulletin A-7263 describes Westinghouse high efficiency fluorescent lamps. Contains features, technical data, and comparative output chart. Typical applications for these lamps are listed and pictured. Advanced engineering achievements as plated leads silicone conting ments as plated leads, silicone coating, triple coiled electrodes are shown. Westinghouse Electric Corp.





### 355-Mercury Lamp Ballast Guide

Bulletin GEA-7056 provides specifiers information on how to select and apply mercury lamp ballasts. Gives data on five construction types, Includes effects of operating conditions, dimensions, electrical data, line current characteristics, outline drawings, and wiring diagrams. Features of this ballast illustrated. General Electric Co.



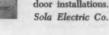
#### 350-Hospital Bedroom Lighting

Bulletin FO describes a unique hospital bedroom lighting and patient service system. Shows 4 types of lighting and up to 6 different services, such as audio visual nurse call and oxygen/vacuum equipment, are consolidated into one compact system. Photometric, application, installation data. Sunbeam Lighting Co.



### 356-Fluorescent Ballast Guide

Bulletin FL-370A is a Buyer's Cuide for fluorescent lighting ballasts. Complete description of warranty, service plan, certifications and other pertinent information. Electrical and mechanical specifications in tabular form given for various types of lamps, indoor and out-door installations.





### 351—Recessed Fluorescent Lighting

"Smoot-Holman Recessed Troffers", available for use in the western states, are described in an 8-page full color brochure. These highly flexible fixtures blend with modern architecture and are ideal for offices, banks, schools, stores. Sizes: 1' x 4', 1' x 8', 2' x 4', 2' x 8'. Suggested layouts shown. Smoot-Holman Co.



#### 357-Lowering Mechanism

Bulletin LM-1 describes Pfaff & Kendall's lowering mechanism for street lights. Catalog includes background data, application, material specifications, installation, operation, maintenance, and ordering information. Electrical characteristics and hanger material specifica-tions tabulcted. Construction drawings. Pfaff & Kendall



#### 352-Bonus Line Fluorescent Ballasts

GEA-6912 describes new Bonus Line fluorescent ballasts for indoor commercial and industrial applications. New capacitor and special thermal protector are new ballast developments by Gen-eral Electric. Bulletin gives full information on Bonus Line protection features, plus ratings, electrical data, dimensions. General Electric Co.



### 358—Surface Mounted Exit Lights

Bulletin 272E details all-aluminum, surface mounting exit lighting fixtures new in design and construction. Shows complete line of 6 in. letter exits. Features interchangeable wiring for incandescent or fluorescent lighting, glow-in-dark glass, shock resisting glass, stenciled metal fronts, and luminous bottoms.

Kirlin Co.

### LIGHTING FIXTURES & ACCESSORIES continued



### 359—Emergency Lighting

Booklet entitled "The Odds on Emergency Lighting" is offered by the Electric Cord Co. Useful features of Light Warden, cost, and how it works described. Floor plans demonstrate the way Light Warden Chargomatic is installed and typical installation costs given. Photograph shows components.



#### 365—Recessed Fluorescent Lighting

Designed to create a new standard in troffer engineering, Litecraft's Imperiale series offers an unusual combination of construction, performance, and installation characteristics. Catalog Section R details features, provides ceiling system drawings, and gives complete lighting data on wide range of shieldings.

Litecraft Manufacturing Corp.



#### 360-Outdoor Luminaire Maintenance

Safety and cost-saving features, typical installations, operating procedures, and available models of Thompson Servisafe pole and bracket units are covered in bulletin PWB-59. Servisafe products permit fast hazard-free ground-level luminaire servicing by one man to assure year-round lighting efficiency.

Thompson Electric Co.



#### 366—Commercial, Industrial Lighting

User Net Price List 61-020, describes the full line of Westinghouse commercial and industrial lighting fixtures. The bulletin is illustrated with a photograph of each unit, provides a general description of the unit, construction and lamp details, ordering information, shipping weights, and suggested net users prices. Westinghouse Electric Corp.



#### 361—Recessed Lighting Calculator

Lighting calculator enables the engineer to quickly select recessed lighting fixtures from Lightolier's Calculite line for a project's specific installation planning. Shows wide, medium, or concentrated light distribution. Simple turn of dial shows fixture spacing and footcandle levels achieved.

Lightolier, Inc.



#### 367—Hospital Lighting

Special hospital issue of the Day-Briter covers hospital lighting, day and night. Describes units for operating rooms, patient's wards, administration and service areas. Types of fixtures applicable to hospital service are illustrated. Lighting layout suggestions are diagrammed. Includes foot-candle recommendations.

Day-Brite Lighting, Inc.



#### 362—Fluorescent Lamp Ballast

Bulletin ATC-112-SF describes Advance's improved Solid-Fill fluorescent lamp ballast, drip free unitized construction. Specifications include lamp and electrical data, dimensions, wiring reference, sound rating, and list prices. Dimensional cross section reference and wiring diagrams keyed to specifications. Advance Transformer Co.



#### 368—Ballast Sound Calculator

Bulletin GEN-147 is a ballast sound rating calculator designed so that you can predict, with 100% accuracy, whether a lighting installation will present a noise problem. Contains a built-in circular slide rule and includes tables which are a part of the calculator. Complete instructions on use.

General Electric Co.



#### 363—Industrial Luminaires

Bulletin describes CA88 Alzak industrial luminaires by Curtis-AllBrite. This new and improved fluorescent lighting fixture provides more glare-free light in industrial plants. The use of Alzak aluminum reflectors assure maximum light. Contains illustrations, specifications, and dimensional data.

Curtis-AllBrite Lighting Inc.



### 369—Kolordot Squares

Bulletin 101 describes Kolordot squares which give new color dimension in luminous Gratelite ceilings and fixtures. Come in four colors enabling you to install colorful mosaic patterns or directional arrows in Gratelite ceilings. Tells how to order and how to install Kolordot squares, Available colors shown. Edwin F. Guth Co.



### 364—Air Handling Troffers

Bulletin B describes a completely new concept in air-handling troffers, available with the *Triple-Shell Lumi-Flo*. An important feature is that the air passageway is completely isolated from the troffer housing. This removes the possibility of temperature variations affecting the light output of the unit.

Benjamin Div., Thomas Industries Inc.



### 370—Luminaires

Bulletin describes a beautifully styled luminaire in 4' and 8' lengths and less than 4" deep with molded 4' refractor in styrene or acrylic. Designed for close ceiling or stem mounting with a sliding clamp hanger. No opaque metal between units creates an unmarred beam of light, Dimensions. Specification sheet available. Wakefield Lighting Div., Wakefield Corp.

# **MATERIALS HANDLING & STORAGE FACILITIES**



#### 371—Vacuum Materials Handling

Bulletin V-100-R describes how Whiting Pressuregrip vacuum handling systems move heavy loads by using the physical pressure of the great sea of air which surrounds the earth. Cross section sketches show how grippers work. Basic components are pictured and described. Pressuregrip systems will fit every need. Whiting Corp.



### 376—Transitubes for Hospitals

Bulletin E 21 describes pneumatic tube systems specially designed by The Grover Company for all types of hospitals. Systems range from small two-station directly connected types to the latest automatic installations linking a hundred or more stations, Illustrated.

Grover Co., Subsidiary of the Powers Regulator Co.



#### 372—Centrifugal Thrower Units

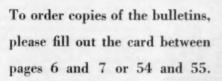
Bulletin 460 describes centrifugal thrower units. Features comprehensive technical engineering data, specifications, graphs, drawings, diagrams, charts, and application photographs. Centrifugal thrower units can be applied to a wide range of dry, granular, flaky and small lump bulk materials handling operations. Stephens-Adamson Mfg. Co.



### 377—Storage Tanks

The current issue of the ECHO, employee magazine of Graver Tank & Mfg. Co., includes several interesting case histories of field-construction. Featured is an article describing the erection of large liquid oxygen and liquid nitrogen vessels. Article tells of floating roof tanks in chemical service and others.

Graver Tank & Mfg. Co.





#### 378—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities.

Clyde Iron Works, Inc.



### 373—Self-Propelled Cranes

Catalog 710-TG-2 describes and illustrates the highly mobile American 100 Series truck and self-propelled cranes in both the 12½ and 15 ton classes. Features of this crane are completely described. Its adaptability for handling a wide variety of fronts are shown and illustrated with on-the-job photographs. American Hoist & Derrick Co.



### 379—Power Free Conveyors

Bulletin 960 describes Columbus Mc-Kinnon's Power-Flex, the power and free conveyor system with Telematic automatic dispatch control. Designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. Construction shown. Columbus McKinnon Corp., Conveyor Div.



#### 374-Tile Tanks and Linings

Bulletin A-160 outlines scope of complete engineering, installation, and maintenance service on tile-faced reinforced concrete tanks, chests, vats, silos, and others. Also includes a wide range of ceramic and membrane linings for resistance against corrosion and abrasion. Various types of tanks are illustrated. Stebbins Engineering & Mfg. Co.



#### 380-Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton "Auto-Signamatic" systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.

Haughton Elevator Co.



### 375—Overhead Traveling Cranes

Bulletin 5000B covers Conco customengineered overhead electric traveling cranes, of double girder construction. Can be furnished in a wide range of capacities and spans. Also included are hand-powered overhead traveling cranes, hand-powered and electric hoists.

Conco Engineering Works,
Division of H. D. Conkey & Co.



### 381—Belt Conveyors

Bulletin 6104 illustrates variety of belt conveyor applications, including high capacity coal handling at large industrial power plant, stockpiling, and reclaiming of raw gypsum rock, aggregate handling at first fully automated concrete block plant, aggregate handling and processing and new equipment. Barber-Greene Co.

#### MATERIAL HANDLING & STORAGE FACILITIES continued



#### 382—Tanks for Corrosive Liquids

Bulletin 45-115 describes BS&B Poxyglas storage tanks for liquids causing corrosion and/or contamination problems. Constructed of machine wound, epoxy resin coated, continuous glass filaments, Poxyglas tanks feature high strength to weight ratio and complete corrosion resistance to many acids. Black, Sivalls & Bryson, Inc.



#### 388-Belt Conveyor Idlers

Sales Manual, Page 3200, describes belt conveyor idlers manufactured by Barber-Greene. Complete line is illustrated, and advantages are given. Cutaways show construction, Selection tables and instructions. Line drawings accompanied by tables of weights and dimensions. Conveyor components shown.

Barber-Greene Co.



#### 383—Pneumatic Conveying Systems

Information on how pneumatic conveying solves bulk handling problems is presented in Bulletin 530. System diagrams point out application and flexibility of equipment. Typical installation illustrated. Bulletin lists materials which can be handled and illustrates accessories.

Dracco Division of Fuller Co.



#### 389—Overhead Materials Handling

Whiting's Trambeam® overhead materials handling systems, crane and monorail, are described in bulletin M-34. Four page spread pictures many applications, large and small, as well as special applications. Various components, which make up the system, are pictured and described. Advantages outlined. Whiting Corp.



### 384—Automatic Handling Systems

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment. Describes Planet's creative service.



#### 390—Cranes for Excavating

Catalog 790-CG-1 describes the all-new, big capacity American 900 Series crane and 4½ yard excavator. The many exclusive features of this crane for handling heavy materials, are listed. Various components are completely described and illustrated. Actual on-the-job photographs show capacity of crane.

American Hoist & Derrick Co.



#### 385-Tanks, Stacks, and Bins

Four-page bulletin describes Graver's services in the fabricating and erecting fields. Completely illustrated, this folder gives a sampling of the tanks, stacks, bins and process vessels which Graver builds in steels and alloys for a wide range of industries. Locations of plants and sales offices included.

Graver Tank & Mfg. Co.



#### 391—Variable Stroke Vibrating Feeder

Bulletin 261 describes Solid Stroke Variable Rate Mechanical Vibrating Feeders. Features comprehensive, technical, and engineering data, specifications, graphs, diagrams, load rating and capacity charts, drawings, and application photographs. Solid Stroke feeders can be applied to many feeding operations. Stephens-Adamson Mfg. Co.



#### 386—Chemical Processing Equipment

Bulletin G-3E described Fuller rotary compressors, vacuum pumps, coolers, preheaters, blowers, fans, exhausters, and pneumatic conveyor systems for handling dry, pulverized, granular and crushed materials. Photographs and operational line drawings, Capacity and rating tables are included.

Fuller Co.



### 392—Perimeter Materials Handling

Bulletin 661 is reprint of article appearing in Western Materials Handling. Describes installation of an automatic perimeter merchandise handling system in a newly constructed department store, the May Company in Mission Valley. Detailed diagram is keyed to picture series showing various components.

Columbus McKinnon Corp., Conveyor Div.



### 387—Steel Derricks

Bulletin 9-H describes Clyde steel derricks, a complete line of modern derricks. Derricks for various applications are pictured. Complete specifications and capacities are given in tabular form. A number of Clyde features are outlined and illustrated. Ordering information. Information on Clyde Hoists included. Clyde Iron Works, Inc.



#### 393—Pneumatic Tube Systems

A 52-page handbook designed to aid consulting engineers in the selection of pneumatic tube systems. Industrial applications, variety of systems available, and engineering data are contained in this reference manual. Fully automatic systems with self-seeking carriers for all types of product handling.

Grover Co., Div. Powers Regulator Co.

# MECHANICAL POWER TRANSMISSION



#### 394-Solid Shaft Gear Drives

Catalog 32 shows applications, specifica-tions, and engineering details of right-angle solid shaft gear drives for centrifugal pumps and many industrial uses. Also describes Redi-Torq drive for use with auxiliary engine to automatically eliminate service interruptions due to power failure.

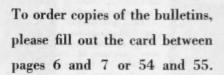
Johnson Gear & Mfg. Co., Ltd.



#### 395-Advances in Modern Gears

A 12-page bulletin which fully describes the advantages in using hardened and precision ground gears. Various applica-tions such as radar-drive units, rotarywing aircraft, high speed gas-turbine drives, dredge cutter drives, marine pro-pulsion, and others are illustrated and their advantages discussed.

Philadelphia Gear Corp.





#### 396—Turbine Pump Drives

Bulletin 31 describes Johnson's right angle turbine pump drives, in standard and combination drive installations, in a wide range of models to meet specific requirements of prime movers and pumps. Introduces new Redi-Torq auto-matic combination drive. Illustrations, power ratings, and average efficiencies. Johnson Gear & Mfg. Co., Ltd.

## MOTELS and HOTELS



#### 397-Point Clear, Alabama

Grand Hotel, Point Clear on Mobile Bay, Alabama, offers colorful booklet on the facilities they provide for the vacationer. An eighteen hole golf course has clubhouse with complete facilities for entertaining. Cruising, fishing, dancing, tennis, and swimming for recreation. Exquisite cuisine and flawless service. Grand Hotel



### 398-Chicago, Illinois

Folder describes the Acres Motel located at 5600 North Lincoln Avenue on U.S. Route 41 in Chicago, Illinois. Accommodations for every taste - single rooms, double rooms, kitchenettes, and apartments. Rooms have individual temperature control. Fine restaurant, swimming pool, and TV. Close to shopping center.



# Albert Pick Hotels and Motels.

401—Galveston, Texas Folder describes Hotel Galvez and Villa located less than one hour drive from Houston via super highway. Thirty mile beach, swimming pool, fishing, horse-back riding, tennis and golf are offered for recreation, Completely air conditioned. Facilities of Moody Center available for conventions up to 3500 persons. Hotel Galvez.

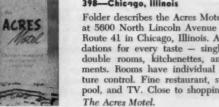
-Complete Hotel Services

Bulletin issued by Albert Pick Hotels and

Motels describes the complete hotel services available in Albert Pick motels.

Includes television in every room, attractive dining rooms, and playgrounds for children. Chain connected by tele-

type for immediate reservation service. Hotel and motel locations listed.





### 399-Minneapolis, Minnesota

Colorful booklet describes and pictures the facilities of the Pick-Nicollet hotel in Minneapolis. Ideal facilities for conventions, meetings, and trade shows. Services include PA systems, television, moving picture projection, and other special equipment in this 600 room hotel. Booklet shows modern decor. Pick-Nicollet.



#### 402-Alabama Convention Spot

Grand Hotel, with its adjacent Lake-wood Golf Club, each year is host to numerous corporation board meetings and sales conferences, as well as to many smaller executive and golfing groups. For those desiring complete information we have a special convention kit. Delightful location, excellent cuisine. Grand Hotel.

# PIPING, VALVES & PLUMBING SUPPLIES



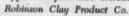
#### 403-Tapping Concrete Steel Pipe

Manual describes the step-by-step procedure for tapping prestressed concrete steel cylinder pipe under pressure. A handy pocket-sized booklet which dis-cusses basic construction of the pipe and describes how small and large taps can be made quickly and safely with ordinary tools. Ideal for on-the-job use. Price Brothers Co.



#### 409-Wedge-Lock Type "O" Joint

New Robinson Wedge-Lock Type "O" joint for vitrified clay pipe is described and illustrated in folder R-460-110. Solves many water handling problems. Specifications of the new joint as well as testing methods used are detailed in the folder. Suggestions on specifying Type "O" joint also included.





## 404—Drench Shower and Eye Wash

Bulletin S-199 describes Haw's drench shower and eye wash combination. Ranch-type shower with cast aluminum eye wash fountain. Unit is illustrated and specifications are included. Line drawing shows construction, gives nec-essary installation data, and includes very complete dimensional information. Haws Drinking Faucet Co.



### 410-Piping Shock and Knock Controls

Manual 60-2 describes Zurn's Shoktrol®. Scientifically controls shock and knock in piping systems. Cutaways show Zurn features and compare them to others in the field. Complete and uncomplicated sizing data for single and multiple fix-ture branches in charts and graphs. Available in a variety of sizes.





#### 405—All-Thermoplastic Ball Valves

Bulletin TTP180 describes new all-thermoplastic ball valve offered by Tube Turns Plastics, Inc. Features top-entry design for quick, easy maintenance plus positive flow control of corrosive fluids. These are furnished in unplasticized polyvinyl chloride or Penton in sizes 1/2" through 2". Other products pictured. Tube Turns Plastics, Inc.



#### 411—Surge Arrestor Valves

Bulletin W-16 describes Golden-Anderson's cushioned surge arrestor valves. Design feature descriptions are keyed to line drawing showing construction. Arrangements for various types of controls are diagramed. Schematics of types of pilot valves show operation. Dimensions, parts list, and specifications. Golden-Anderson Valve Specialty Co.



#### 406-Nonmetallic Pipe

Booklet describes Youngstown's Fibercast pipe for use where corrosion, pres-sure, and temperature are critical problems. Describes and pictures various ap-plications. Gives many advantages of using Fibercast pipe. Outlines ease of handling. Offers complete line of fittings. Fibercast Co., Division of the

Youngstown Sheet & Tube Co.

Bulletin T-495 gives specifications, capacity ratings, and selection data on line of electric drinking water coolers. Models from 3 to 22 gph. Air cooled or

water cooled condensing units. Wall

mounted or wall flush types, explosion-



### 412—Rubber Seat Butterfly Valves

Bulletin 6 describes Pratt's all new design of three types of rubber seat butterfly valves. Available sizes 3" to 144" with pressures from vacuum to 150 psi. Bulletin includes complete dimensions, information regarding operators, design features, cross sections, and technical data. Operation shown. Henry Pratt Co.



### 413—Forged Steel Fittings

Catalog W-6, tab-indexed for convenient reference, describes Bonney's complete line of welding fittings and forged steel fittings. Charted information gives stock sizes, weights, and dimensions. Diagrams show construction and are keyed to tabulated dimensions. Installation and selection data included.

Bonney Forge & Tool Works.



KENNEDY

407-Drinking Water Coolers

proof, freezer-compartment, all stainless steel, hot and cold, remote models. Temprite Products Corp. 408-Valve and Hydrant Manual Catalog M612 provides complete de-

catalog Mo12 provides complete de-scription of Kennedy A.W.W.A. valves and hydrants combined with details of construction in exploded and cross section views. Also has all information necessary for installation, maintenance, inspection and repair, plus detailed spec-

Kennedy Valve Mfg. Co.



#### 414-Valves

Catalog 232 describes Powell valves of bronze, iron, steel, and special alloys. This condensed catalog illustrates each type of valve offered. Cutaways show construction and operation. Complete specifications are given in tabular form. This informative catalog gives all information necessary for selection.

Wm. Powell Co.





### 415—Plumbing Fixtures

A condensed catalog containing pictorial illustration and complete dimensions of Crane fixtures available for schools, hospitals, industrial plants, institutions, and all types of commercial buildings. This handy booklet includes description of product and mounting features that will help to determine application.





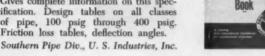
#### 421-Non-lubricated Plug Valves

Bulletin describes Con-O-Sphere ball valves with revolutionary sealing cap-sule giving maximum possible sealing. Cutaway shows construction. Exploded view pictures components and arrangement. Detailed dimensions are tabulated and keyed to line drawings. Application information and features included. W-K-M Division, ACF Industries.



#### 416-Water Pipe Technical Manual

Bulletin 100 describes Southern Pipe's cement-mortar lined and mortar coated steel pressure pipe manufactured to Federal Specification INT. SSP-00385. Gives complete information on this specification. Design tables on all classes of pipe, 100 psig through 400 psig. Friction loss tables, deflection angles.





#### 422—Steam Traps

Catalog K describes Armstrong's steam trape. Gives pertinent general informa-tion. Lists features and gives complete details on various types of traps. Cut-aways show operation, drawings show aways show operation, triawings show dimensions, and tables give specifica-tions. Selection data includes capacity chart, graphs, tables, and drawings. Armstrong Machine Works.



### 417—Gate Globe, and Check Valves

Bulletin D-1 describes Dart malleable iron unions and union fittings. Made with bronze to bronze seats these unions are ground to a true ball joint and guaranteed to give a drop tight seal. Dimensions given in tabular form for all sizes in all types. Cutaways show construction of each type. Fairbanks Co.



### 423—Pipe Joints

Technical Bulletin 4, issued by the Clay Sewer Pipe Association, discusses various types of pipe joints. Important informatypes of pipe joints, important informa-tion as to general procedure included. Types of joints and jointing procedures are illustrated. Hot poured bituminous, precast bituminous, and wedge-lock joints are described in detail. Clay Sewer Pipe Association, Inc.



### 418—Fabricated Pipe Fittings

New 8-page condensed catalog summarizes complete line of Naylor light-weight pipe, fittings, flanges, and connections. List typical applications, Includes standards specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines. Naylor Pipe Co.



### 424-Bar Stock Valves

Bulletin DH-766-B gives complete in-formation on K-P&C bar stock valves. Available in a range of metals and sizes for applications requiring close control valves capable of withstanding a wide range of working temperatures and pressures. Completely illustrated.

American Chain & Cable Co., Inc. R-P&C Valves Division.



#### 419—Steam-Jacketed Valves

Bulletin E-200 describes Everlasting's steam-jacketed valves ideally suited to handling different types of viscous materials. Cutaway shows construction and operation. Exploded view shows components and arrangement of parts. Includes list of features, application photographs, and side and end views. Everlasting Valve Co.



#### 425—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications.

Speedline Fittings Division, Horace T. Potts Co.



### 420—Insulated Piping Systems

The new edition of the Ric-wiL prod-The new edition of the Ric-wil. product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include Hel-cor, Uniline, Type J, and cast iron. Prefabricated accessories are also included. Ric-wiL, Inc.



#### 426-Glass-Lined Sewer Pipe

Folder deals with the glass-lined sewer roller deals with the glass-lined sewer pipe with a mechanical joint. Amolt Glas-Glaz pipe is available in 4-ft lengths. It is root and infiltration proof and is glass coated inside and out. The pipe has been designed for an under-the-house drain and also as a house-tostreet sewer. Assembly operations shown. American Vitrified Products Co.



### 427-Wedge-Lock Clay Pipe

Bulletin R-359-87 describes Robinson's Wedge-Lock clay pipe. Shows how it provides tighter joints to resist roots and combat infiltration in the house, in the ground, and under basement thors. In-stallation procedures for Wedge-Lock factory-made joints are illustrated. Line of fittings pictured. Applications given. Robinson Clay Products Co.



#### 433—Laying Concrete Pressure Pipe

Pocket-size manual describes the stepby-step procedures for laying concrete pressure pipe. Includes instructions for digging the trench, checking the grade, handling the pipe, lubricating the joint rings, and other pertinent points. Also includes detail drawings, deflection data, pipe sizes, and list of supplies. Price Brothers Co.



#### 428—Relief-Unloading Valves

Bulletin S-5 describes Golden-Anderson's cushioned automatic relief-unloading valves for steam, air, gas, and fluid control service. Includes pilot and main valve parts list, sequence of operation, installation procedures, flange dimensions, specifications, and list of materials used in components.

Golden-Anderson Value Specialty Co.



### 434—Plumbing Fixture Supports

Comprehensive technical manual 60-4 illustrates and describes Zurn's Monolithic system for supporting siphon-jet wall closets. Makes possible up to 19 batteries on one stack. Cutaways show construction and diagrams give dimensions. Roughing-in details and complete engineering drawings. Specifications. Zurn Industries, Inc.



#### 429-Mortar Lined and Coated Pipe

Southern Piping, publication of Southern Pipe Division of U. S. Industries, Inc., annuonces that cement mortar lined and reinforced mortar coated steel pipe became government improved with the issuance of Interim Federal Specification SSP-00385. Southern Pipe's Steelcor Cemcote meets every requirement. Southern Pipe Div. U. S. Industries, Inc.



#### 435—Valves for Liquids and Gases

Catalog 61 describes Powell valves for cryogenic and allied services, liquid and gaseous. Contains over 100 pages of schematics of check valves, gate or schematics of check valves, gate valves, and globe and angle valves. Al-phabetical as well as figure number in-dex in front of this loose-leaf book. Specifications are given on drawings. Wm. Powell Co.



#### 430—Rubber Seat Ball Valves

Catalog BA-1 describes the new Pratt rubber seat ball valve in sizes from 10" through 48". Available in 150 psi and 250 psi designs. Features, applications, construction, and dimensions. Rubber seat provides bubble-tight closure and long life. Remarkably easy to operate. Manual, cylinder motor operators. Henry Pratt Co.



#### 436-Jointed Vitrified Clay Pipe

Jointed vitrified clay pipe known as Amvit, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out. American Vitrified Products Co.



#### 431—Proper Bedding Procedures

Bulletin 3 describes proper bedding procedures in the design and construction of sanitary storm sewers. Diagrams show shaped bedding with tamped backfill and compacted granular bedding with tamped backfill. Dimensions are given on the drawings. Completely described in the text. Association members listed. Clay Sewer Pipe Association, Inc.



#### 437—Forged Steel Fittings

Catalog FSF2 describes Bonney's forged steel fittings. Contains information on socket weld fittings, screwed fittings, couplings, reducers, caps, reducer inserts, plugs, and bushings. Complete dimensional data is keyed to line drawings. Weights for various sizes is tabulated. Other products illustrated.

Bonney Forge & Tool Works.



#### 432—UPVC Pipe Fittings and Flanges

Catalog 119 describes full line of pipe fittings, flanges and valves manufactured by Tube Turns Plastics, Inc., in unplasticized polyvinyl chloride and other industrial thermoplastic materials for lowcost handling of corrosive fluids and gases. Technical section gives complete engineering specifications and data. Tube Turns Plastics, Inc.



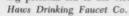
#### 438-Wall Mounted Water Coolers

Bulletin T-474 presents Temprite's Wall Temp, Model WT-13, wall-mounted water coolers. Design features of this new concept in drinking fountains are illustrated. Complete specifications, which are given, include complete dimensional drawings. Capacities, gallons per hour of 50° drinking water, are included. Temprite Products Corp.



#### 439—Audio-Visual Safety Alarms

Bulletin S-203 describes Haws' Series 9000 automatic, audio-visual alarm assembly which adapts to any Haws Emergency eye-wash fountain and drench shower. When emergency equipment valves are opened, audible alarm and visible light are actuated, attracting personal aid to the victim.





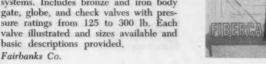
#### 445-Ball Valves

Bulletin AE-1061 describes W-K-M's non-lubricated plug valves providing tight-resilient seal and giving maximum wear resistance. Advantages described and illustrated. Cutaways show construction, components, and give material composition. Dimensions and specifications for wrench and worm gear operated. W-K-M Division, ACF Industries.



#### 440—Malleable Iron Fittings

Bulletin V-6 is a condensed catalog of the more popular Fairbanks valves used in heating, piping, and air conditioning systems. Includes bronze and iron body gate, globe, and check valves with pressure ratings from 125 to 300 lb. Each valve illustrated and sizes available and basic descriptions provided.





#### 446-Nonmetallic Pipe Manual

Manual SPA-043B gives technical and specification data on Youngstown's Fibercast non-metallic pipe. Complete specifications are charted on various sizes. Chemical resistance chart lists chemicals with recommendations at various temperatures. Tables, diagrams and graphs. Fibercast Co., Division of the

Youngstown Sheet & Tube Co.



#### 441—Lightweight Pipe and Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor. Suggested arrangements. Naylor Pipe Co.



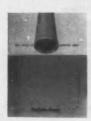
#### 447—Valve Maintenance Manual

Catalog M601 shows the complete line of Kennedy Underwriters' Approved hydrants, valves and indicator posts along with detailed information selection, in-stallation and maintenance. Cross section and exploded views show components in order of construction and operation. Complete specifications. Kennedy Valve Mfg. Co.



#### 442—Gate Valves

Bulletin ADB-1002 describes Crane's gate valves, sizes %" to 2", 125 and 150 pound for steam, oil, water and gas. Cutaway shows construction and operation. Working pressures are charted. Complete sizes and dimensions are tabulated and keyed to diagrams. Comply with ASTM and Federal Specs. Crane Co.



#### 448—Concrete Pressure Pipe

Booklet gives a comprehensive story of concrete pressure pipe for water lines. Explains the principle of prestressing. Describes the procedures for installing and tapping pressure pipe. Includes tables of sizes, weights, and normal operating heads for each type of pipe. Flexible watertight joints diagramed Price Brothers Co.



### 443—Standard Steel Pipe

Bulletin SPA-035-760 describes standard continuous weld and seamless steel pipe for transmission of air, gas, steam, water, oil, and other fluids. Specified for commercial and industrial installations. Photographs show pipe being installed during construction. Complete specifications for various types of pipe. Youngstown Sheet and Tube Co.



### 449—Laboratory Service Fittings

Engineers' Manual B describes laboratory, hospital, and school plumbing brass fixtures. Exploded views of water valves show sequence of components. Dimensional drawings on each type of fixture offered. Instructions on how to specify. List prices on all fixtures given. Also includes electrical fittings. Water Saver Faucet Co.



#### 444—Bronze Ball Vaives

Bulletin DH-38 describes new forged naval bronze ball valve with Auto-mating seats which insure positive seating. Bune "N" seats impregnated with molybdenum disulphide insure a slippery, non-galling surface. Wiping action of ball forces out foreign matter, prevents wear. R-P&C Value Division, American Chain & Cable Co., Inc.



#### 450-Bronze Gate Valves

Bulletin E-165 describes Everlasting valves for general services. Classified index gives type, typical service, and page number. Distinctive features of Everlasting valves outlined and illustrated with cutaway and exploded view. Special arrangements, duplex boiler blow-off units and parts lists included. Everlasting Value Co.



#### 451-Ball Valves

Bulletin ADB-1001 describes Crane's ball valves suitable for chemical, petroleum, and paper industries as well as utilities, power, and general services. Cutaway shows construction and components. Dimensions and temperature and pressure rating are tabulated. Exploded views show valve, cartridge parts. Crane Co.



#### 457—Steel Valves

Bulletin 610 describes new line of Strong's Evrtyte ball valves. Complete information on carbon steel or stainless steel valves, sizes %" to 1", is given. Included are dimensions, list prices, and capacities. Bar stock, top entry ball valves are designed for gas, air, oil or chemical service.

STRONG.



#### 452-Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of bell and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves. R. D. Wood Co.



#### 458—Plumber's Brass Goods

Catalog PB-60 lists McDonald's complete line of plumber's brass goods. Each item is fully described and illustrated. Specifications include catalog number, size, weight, and pieces per carton. Includes valves of all kinds, sink sprays, copper tube fittings, gas cocks, steam stops, fill caps, and vents. Trade customs. A. Y. McDonald Mfg. Co.



#### 453—Duo-Check Valves

Bulletin 4161 describes Duo-Chek valve which performs all regular check valve duties, yet is smaller, lighter, easier to install. Space occupied as low as 4% and weight less than 10% of conventional check valve. No slam or water hammer. Sizes 2" to 48", ASA series 125 to 2500. Steel, stainless, aluminum, and bronze. Mission Valve and Pump Co.



#### 459—Tapping Machines

Bulletin W-8912 describes Mueller's double pressure chamber tapping machine, the B-100. This machine makes faster taps; assures pressure tight connections; provides trouble-free operation. Can be used by hand or power. Cutaway shows construction and operation. List and pictures equipment. Mueller Co.



#### 454—Fiber Pipe and Fittings

Catalog No. 307 describes Orangeburg pipe and fittings and Orangeburg perforated pipe. Outlined are their many uses and advantages for underground non-pressure applications outside the dwelling. Pipe, fittings, and adapters are illustrated and accompanied by specifications.



#### 460—Steam Traps

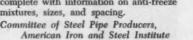
Twelve page technical article by John W. Welker covers all types of steam traps. Describes various designs, how they work, proper application, proper sizing, correct installation and maintenance procedures. Generously illustrated with drawings, diagrams and charts. Complete technical data. Yarnall-Waring Co.



#### 455—Snow Melting Systems

Orangeburg Manufacturing Co.

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing.





#### 461—Complete Plastic Piping Systems

Newest catalog from Kraloy/Chemtrol Co. describes complete line of non-corrosive plastic pipe, fittings, valves and pumps. Engineering data augment comprehensive coverage of products and services offered. Corrosion resistance data covers PVC I, PVC II, ABS, Penton, Polyethylene, Viton, and Buna-N. Kraloy/Chemtrol Co.



### 456—Saran-Lined Piping Systems

Bulletin 157-145-61 describes Saranlined pipe, fittings, valves, and pumps distributed by Saran Lined Pipe Company. Gives industrial applications, advantages, and dimensions. Fittings, valves, and pumps illustrated with photographs and schematics. Schematics show operation, construction.

Dow Chemical Co.



#### 462—Flexible Ball Joints

Bulletin 31A contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from ¼ inch to 12 inches, including high temperature steel piping.

Barco Manufacturing Co.



#### 463—Drinking Fountains and Coolers

Catalog describes the Halsey Taylor line of stainless steel drinking fountains and electric water coolers. Wall, recessed and face mounted, bracket, counter, and floor types included. Diagrams show dimensions for all elevations. Specifications include capacity chart for all models. Phone and address of branch offices. Halsey W. Taylor Co.



#### 466—Complete Piping Service

Brochure describes services and manufacturing facilities of M. W. Kellogg Company. Kellogg will design, supply, and erect quality pressure piping as specified by you. Booklet outlines services in detail. Their modern equipment effect economies. Photographs show operation and fabrication methods.

M. W. Kellogg Co.



#### 464—Valve Attentuators

Bulletin K-52 describes *Pneumavaloe* by Connor Engineering Corporation, total constant volume high velocity valve attenuators. Includes features, controls, operation, performance data, dimensions, ratings, and specifications. Components of various assemblies detailed and illustrated. Drawings show dimensions. *Connor Engineering Corp.* 



#### 467—Pressure Pipe Line Strainers

Bulletin 6 illustrates and describes Nugent pipe line strainers for fuel oil, lubricating oil, and a wide variety of other fluids. Design, construction, and operation is explained and illustrated. Strainers may be furnished with magnetic separator. Specifications and capacity tables in chart form.

Wm. W. Nugent & Co., Inc.



#### 465—Asbestos Cement Pressure Pipe

All standard sizes and classes of asbestos-cement pressure pipe are listed in illustrated 4-page folder AP-27. Folder cites low costs of transportation, installation and maintenance; describes patented Fluid-Tite coupling that forms a permanently, automatically leak-tight seal. Standard sizes and classes listed. Keasbey & Mattison Co.



#### 468—Valve Controls

Bulletin 1-60 fully describes the most popular type of Limitorque Valve Operator. What Limitorque is, does, and operates are clearly explained. Also, contained are complete dimensions and parts lists with drawings. Preferred mounting positions, operating tips and supplementary equipment illustrated. Philadelphia Gear Corp.

# PLANT SITES



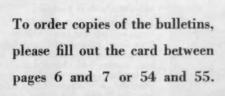
### 469—New York State Plant Locations

Bulletin "At Your Command" describes plant location services offered by the Niagara Mohawk Power Corporation. Services include inventory of available industrial sites and buildings. Offer detailed analysis of community facilities, taxes, government, and other important characteristics. No cost or obligation. Niagara Mohawk Power Corp.



### 470—Industrial Opportunities

A colorful new presentation of Colorado's industrial opportunities. Included are booklets on manufacturing, power, raw materials and resources, transportation, markets and labor, Colorado living, industrial site locations, state highway map, and full color recreation booklet. Up-to-the-minute data in portfolio form. Colorado Department of Development.





#### 471—New York Industrial Facilities

Comprehensive booklet on industrial facilities available in Upstate New York. Describes availability of produce markets, general labor supply, and availability of skilled supervisory and professional labor. Offers world market via waterways. Graphs show manufacturing and small business expansion.

Niagara Mohawk Power Corp.

# **POWER EQUIPMENT & FUELS**



#### 472—Heat Recovery Silencers

An informative 24 page illustrated technical article on Utilization of Waste Heat from Internal Combustion Engines. Schematic layouts are used to illustrate various applications. Cutaways show construction and operation. Included are specifications descriptions to assist in developing bids.

J. B. Beaird Co., Inc.



### 478—Gas Turbine Compressors

Bulletin describes Solar's centrifugal gas turbine compressors for gas compression and general industrial use in the low sion and general industrial use in the low volume range up to 1500 psi. Multiple unit installation illustrated. Charts sim-plify proper selection for specific ap-plication. Examples of use. Specifica-tions with dimensional diagram.

Solar Aircraft Co.



#### 473—Watertube Boilers and Heaters

Bulletin PD-100, new, covers watertube boilers, heaters and stokers manufactured by Bros Inc. Detailed diagrams show construction of equipment, Complete information includes applications, variety of fuels, capacities, pressures, and fea-tures. List of national representatives is given. Completely illustrated.

Bros Inc.



#### 479-Dual Fuel Burner

Bulletin B11 describes Series J Webster Cyclonetic burner for gas, oil or gas/oil firing. Two sizes cover range of 700,000 to 4,200,000 Btu/hr input for negative or positive furnace pressure. Illustrates pedestal and suspended flange mountings explains indicating timer sequence. ings, explains indicating timer sequence. Webster Engineering,

Div. Midland-Ross Corp.



#### 474-Bent Tube Boilers

Bulletin VF VS-2 presents design and construction details and illustrates installations in a diversity of industries. Basic design of these two drum units provide maximum capacity where floor space and head room are limited. Furnaces handle fluids fired in suspension or with various types of stokers.

Henry Vogt Machine Co.



#### 480-Waterback Boilers

Revised Bulletin 509B describes the full Nevised Bulletin 509B describes the full waterback boiler design, pioneered by Johnston, with illustration of an actual cutaway boiler. Completely factory fire tested and assembled in sizes from 75 to 750 hp, pressure to 250 lb. Extra equipment described. Specifications and dispersional data are to bulleted. mensional data are tabulated.

Johnston Brothers, Inc.



#### 475-Intake Snybbers

Bulletin 279 describes the intake snubber for use with positive displacement blowers, reciprocating compressors, and gas and diesel engines naturally aspirated and positive scavenged. Sizes 8" through 30" pipe sizes. Catalog furnishes complete data, dimensions, and specifications. Cutaway shows construction.

Burgess-Manning Co.



#### 481—Ramfeed Stokers

Bulletin 360 details Detroit's LoStoker, a ramfeed side dump stoker for heating and commercial boilers, Capacities 3000 to 12,000 psph. Cutaways show operation and heat flow. Typical installations with various types of boilers illustrated. Line drawings detail setting arrangements. Features pictured.

Detroit Stoker Co.



#### 476—Positive Flow Packaged Boilers

Bulletin 1275 describes Orr & Sembower's new positive flow boiler. Boiler has been tested and proven by a famous consulting engineer firm. Design permits both feed injection and natural thermal circulation to augment each other thus providing maximum circulating rate and most efficient form of heat transfer.

Orr & Sembower, Inc.



### 482—Feedwater Deaerators

Bulletin 575-A explains continuous boiler feed water deaeration under .005 cc/liter without vent loss or adjustment, over a 10-to-1 load swing, without sodium sulphite. Illustrates operating principle and components. For boiler plants with capacities from 3,000 to 125,000 lbs/hour. Specifications are included.

Fred H. Schaub Engineering Co.



#### 477—Completely Packaged Boilers

Superior packaged boilers, both fire-tube and water-tube are described in this new catalog. Designed for capacities from 20 to 600 bhp in the fire-tube line, from 4,000 to 61,000 lb/hr in the watertube line, and all firing gas, oil or both. Superior packaged boilers are backed by undivided responsibility.

Superior Combustion Industries Inc.



### 483—Waste Heat Recovery

Bulletin WHB 59-3 describes the economic utilization of excess heat developed from diesel exhaust gases and industrial and chemical processes. Specific industrial, marine, and chemical applications of varying capacities and services are illustrated. Advantages of bare tube and extended surface designs are noted. Foster Wheeler Corp.

### POWER EQUIPMENT & FUELS continued



#### 484—Boiler Auxiliary Packaged Units

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.





#### 489—Combustion Control Systems

Bulletin C-1 describes Webster Series 14 pneumatic positioning combustion control system for boiler firing. Includes description of pneumatic pilot, butterfly valve governor, remote manual station and control centers. Advantages are explained and features pictured.

Webster Engineering, Div. Midland-Ross Corp.



#### 485—Diesel and Gasoline Engines

Bulletin 1151 reviews 26 models of White Superior engines, diesel, dual-fuel, or gasoline. Complete specifications in-clude type, number of cylinders, bore, stroke, displacement, weight, rpm, and bhp. Diagram is keyed to tabulated dimensions. Engines span range of 190 to 2150 bhp, six or eight cylinders. White Diesel Engine Div.,



#### 490-Condensate Return Units

New Bulletins 900 and 910 fully describe Weinman Types ACV and ADV simplex and duplex condensate return and bioler feed units with either steel or cast iron receivers that provide trouble-free service in all types of "wet" heating systems. Drawings, charts, and selection tables are included.

Weinman Pump Manufacturing Co.



To order copies of the bulletins, please fill out the card between pages 6 and 7 or 54 and 55.



#### 491-Cast Iron Bailers

Bulletin EM-316 entitled "Normal Flow Versus Reverse Flow In Cast Iron Boilers" examines the question of flow direction in cast iron boilers of conventional design. Appendix to bulletin illustrates suggested boiler piping con-nections for Weil-McLain gas and oil fired boilers. Completely illustrated.

Weil-McLain Co., Inc.



#### 486-Custom Built Equipment

Bulletin E-1 illustrates a wide range of custom built equipment. Includes steam generators, stills and towers, heat exchangers, reactors, oil chillers, crystallizers, and ice making and refrigeration equipment, which serve numerous applications in power plants, refineries, chemical plants, and related industries. Henry Vogt Machine Co.



#### 492—Engine Power Rating Chart

Bulletin 1079-K is a power rating chart, giving a complete tabulation of horse-powers, speeds, and loads for Waukesha engines and power units. Lists engine and power units operated by diesel, LP gas, gasoline, and natural gas fuels. Concise and easy to read, punched and ready for insertion in loose-leaf binder.

Waukesha Motor Co.



#### 487—Induced Draft Fans

Bulletin L-3 describes Lehigh's line of centrifugal induced draft fans. Covers rating tables shown at 600°F, dimension data, and construction material specifications. Recommends sizes of fans for oil, gas or coal fired boilers. Includes typical installations and photographs.

Lehigh Fan & Blower Division, Fuller Company.



#### 493-Water Gate Hoists

Catalog CH-353 describes gate hoists specifically designed to control water levels on nydro-electric power plant installations. Íllustrates some typical hoists. Lists types of stationary and traveling gate hoists and the types of power dam gates for which they are applicable. Capacities from 1 to 100 tons.

D. J. Murray Manufacturing Co.



### 488—Internal Combustion Engines

Catalog EN403 describes 4-cycle, shortstroke, air-cooled internal combustion engines manufactured by Kohler Company. Each model is illustrated. General specifications, dimensions, and various applications given. Use of engines in various types of equipment are shown in photographs. Other Kohler products.



#### 494—Boiler Feedwater Treatment

Bulletin 30, an introduction to boiler feedwater treatment by Nalco. Discusses such subjects as Water, the Raw Ma-terial for Making Steam, Why Water Treatment is Needed, Removing the Impurities, and Treating Boiler Feedwater. Appendix contains data on water chemistry, water analysis, conversion factors. Nalco Chemical Co.

### POWER EQUIPMENT & FUELS continued



#### 495-Oil and/or Gas Fired Boilers

Bulletin 1260 describes and illustrates Powermaster Model 3 line. Includes gas, oil, and combination gas/oil models, a new specially designed hot water boiler, and the new stream atomizing principle for use with No. 6 oil. Ratings and di-mensions of all sizes in line are included. Cutaway shows operation.

Orr & Sembower, Inc.



#### 501-Atomizing Burners

Bulletin 200B describes the 200 Series now available from 20 to 250 hp, pressures to 250 lb. Quiet low pressure air atomizing burners for preheated or cold oils, gas burners or combinations. Text explains how water cooled combustion chamber increases tube life and eliminates ligament cracks. Dimension Charts. Iohnston Brothers, Inc.



#### 496-Stokers

Catalog 40 describes Detroit's Rotograte stoker burning many grades of bituminous coal, lignite, and refuse fuels. Cutaway and line drawing show operation. Specifications illustrated. Schematics show stoker in combination with various makes and types of boilers. Installations in photographs, engineering drawings. Detroit Stoker Co.



#### 502-Exhaust Snubbers

Bulletins 281, 282, 283 describe a line of three exhaust snubbers for internal combustion engines, rotary blowers, vacuum pumps, and steam jet ejectors. Each series furnishes a different degree of silencing, For 8" and larger pipe sizes. Bulletins furnish complete data and specifications.

Burgess-Manning Co.



#### 497-Maxim Silencer Handbook

Catalog describes Maxim Silencers, proven in performance for every use. Exhaust, intake, air jacketed, high velocity steam, air discharge, spark arrestor, heat recovery, and marine engine wet exhaust silencers are listed in catalog. Information includes model number, and available sizes.

J. B. Beaird Co. Inc.



# To order copies of the bulletins, please fill out the card between pages 6 and 7 or 54 and 55.



### 498—Gas Turbine Engines

Booklet describes Solar's gas turbine engines, a small, light, and efficient source of power. Run on a wide variety of fuels. Text with diagram shows how they work. Complete engine data, including charts and graphs, are given on each model. Diagrams show operation and construction. Applications listed. Solar Aircraft Co.



#### 503-Vented Deaerators

Bulletin 1300 explains simple, fully vented deaerator that assures positive, economical oxygen removal to .03 cc/liter from feed water, heating equipment, and return lines. Illustrates operating principle and components. For boiler plants with capacities from 1,000 to 30,000 lbs/hour. Representatives listed. Fred H. Schaub Engineering Co.



### 499—Packaged Steam Generators

Bulletin PG-61-1 describes Foster Wheeler's automatic packaged boilers, oil or gas fired, available in capacities from 13,-000 to 100,000 lb per hr with design pressures from 250 to 1350 psi. Cut-away drawing and diagrams show construction, Capacities and dimensions in tabular form. Optional equipment listed. Foster Wheeler Corp.



### 504—Packaged Hot Water Boilers

Type CC Superior packaged hot water boilers firing gas, oil, or both are described in this catalog. Capacities from 670,000 to 11,720,000 Btu/hr and equipped with newly developed Venturi-action mixing tube, Type CC has four passes, 5 sq ft of heating surface per bhp, and induced draft. Superior Combustion Industries Inc.



#### 500—Compressed Air Filters

Catalog 6000 covers compressed air filters of 20 to 200 scfm capacity that remove all harmful traces of dirt, water and oil down to 2 microns or less, go months without maintenance. Describes new, exclusive scrub-and-polish action with cleaning-by-coalescence. Lists models for all needs, X" to 2" pipe size. King Engineering Corp.

#### 505-Aftercoolers and Air Dryers

Bulletin A-420 describes Johnson's refrigerated aftercooler and air dryer for compressed air systems. Gives models, capacities, features, adjustments, and mounting. Schematic shows coolerant and compressed air flow. Specifications for compressor, motor, and component parts. Dew point tables, dimensions. Johnson Service Co.

### POWER EQUIPMENT & FUELS continued



### 506-Steam Generators

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S," pendant, and drainable superheaters. Specifications are given.

Wickes Boiler Co.



#### 507-Forced-Draft Burners

Bulletin describes compact forced-draft package unit burner. This single, coordinated, factory-tested assembly, ready for attachment to boiler, combines all necessary equipment for burning oil or gas fuels. Gives details of design and features. Diagrams are keyed to r art giving dimensions for all models.

S. T. Johnson Co.

To order copies of the bulletins, please fill out the card between pages 6 and 7 or 54 and 55.



#### 508—Gas-Fired Boilers

Bulletin HY-F100-2 describes Hydrotherm's gas-fired, cast iron boilers in 11 sizes from 50,000 to 300,000 Btu input. Operating principles outlined and illustrated. Includes construction and operation features, capacity range, installation dimensions, weights, and applications. Photographs show types of installations. Hydrotherm, Inc.



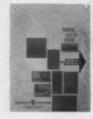
### 509—Condensate Scavenger Filters

New Bulletin ADC 9-1010-761 describes Cochrane's condensate scavenger filters. Illustrations and diagrams show theory and operation through the precoating, filtering, and cleaning cycles. Tables on allowable impurities in feedwater for once-through boilers and solids added to feedwater due to condenser leakage. Cochrane Division, Crane Co.



#### 510—Engine-Generator Combinations

Bulletin SA-626 Climax V-12 Series Industrial Enginators, the engine-generator combination. Operates on natural gas, sewage gas, LPG, or gasoline. Shows graph of fuel rate and chart of capacities. Includes engine specifications and standard accessories, generator specifications and controls. Schematics and dimensions. Climax Engine Mfg. Co.



#### 511—Burners and Boilers

Check-list IC-169 in book form gives locations of Hev-E-Oil Burners, Hev-E-Duty Gas Burners, and New Highlander Automatic Boiler-Burners in use in 1961. The list is categorized into types of installations, geographical locations in the U. S. and Canada. Product information is also included.

Industrial Combustion, Inc.



#### 512—Gas for Fuel

Bulletin issued by the American Gas Association shows gas to be versatile, efficient, and economical because of the wide variety of available equipment in sizes and types to fit every job. Various types of equipment for heating and cooling are detailed. Also discussed are water heating, lighting, and incineration. American Gas Association



#### 513—Packaged Boilers

Bulletin WT-101 describes Bros Series P packaged boilers with a capacity range 10,000 to 80,000 psph and standard design pressures 200 and 250 psi. Detailed cutaway shows construction and operation and is keyed to description of components. Detailed dimensional drawings are keyed tabulated specifications.



#### 514-Draft Controls

Comprehensive booklet issued by Conco Engineering Works is a detailed study on the control of draft in gas-fired equipment. Contains technical information on the function and production of draft together with control, shortage and excess. Includes tables and wiring diagrams. Specification guide selection. Field Control Division



### 515—Gas-Fired Air Makeup Units

Belt-driven and direct-connected units, featuring self-contained package construction, offered in a wide range of sizes, capacities, and Btu/hr ratings for all sizes of areas and types of structures. Bulletin 860 contains complete data on burner and control assemblies with illustrations and installations.

Aerovent Fan Co., Inc.



#### 516-Natural Gas Engines

Bulletin DN1101 describes Caterpillar's natural gas engines as a source of economical and efficiert power. Various types of applications are outlined. Contains estimated hourly operating cost breakdown. Gas engine rating chart and technical graphs included. Photographs shows various types of installations.

Caterpillar Tractor Co.

### **PUMPS & COMPRESSORS** continued



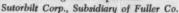
#### 517-Rotary Pumps

Catalog 62-S describes the line of general purpose and heavy-duty Viking rotary pumps as well as many models built for special applications. Bulletin is completely illustrated. Includes specifications on models ranging from % to 1050 gallons per minute. Folder also includes list of worldwide distributors. Viking Pump Co.



#### 523—Pumps and Blowers

California series rotary positive, gas pumps and vacuum pumps are described in bulletin S-59I with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Many features detailed. Typical field applications. Drawing shows operation.





#### 518-Deepwell Submersible Pumps

Bulletin B1400 gives performance data and illustrates major features of Sumo high capacity 3550 rpm and 1750 rpm pumps from 600 to 3400 gpm, for industrial, commercial, and municipal water supply and booster service. Cutaways show features and construction. Specifications and special applications. Sumo Pumps, Inc.



#### 524-Submersible Pump Manual

Bulletin 1000 contains complete information about Pleuger submersible pumps, motors, and unique pump accessories. Installation procedures, testing methods, and unusual applications of submersible pumps are described. Sizes from 1/3 hp to 1000 hp, capacities from 5 gpm to 50,000 gpm.

Pleuger Pump Manufacturing Co.



#### 519—General Purpose Rotary Pumps

Latest tables, diagrams, dimension drawings, and photographs of entire series are included in catalog F-4177. Shown are examples of bedplate-Shown are examples of bedplate-mounted, gasoline engine and electric motor driven units. Information about lightweight Fig. 1809 and Fig. 3638 models for petroleum and process fields. Roper Hydraulics, Inc.



### 525—Circulating Pumps

Bulletin 1470.5 concerns Pacific quiet operating circulating pumps, Type C8L Supporting feet are cast integral with volute to eliminate possibility of pipe strain being transmitted to bearings and to make for easy disassembly without touching piping or removing motor. Graph of characteristic curves.

Pacific Pumping Co.



### 520-Submersible Sump Pump

Catalog 259 describes the complete line of Enpo submersible pumps and accessories. It shows data on design, construction, performance, operation, a list-ing of standard models and capacities of each. Recommendations for installation and suggested applications are also shown. All ratings are specified. Piqua Machine & Mfg. Co.



## 526—Close-Coupled Industrial Pumps

Bulletin 1100-A offers Layne & Bowler's Verti-Line pumps for industrial and municipal primary water supply. Table shows range of conditions which can be accommodated by these pumps. Also includes table of head-capacity range in relation to horsepower. Line drawings show head assemblies, typical systems. Layne & Bowler Pump Co.



### 521-Propeller Pumps

Bulletin 1024A describes Johnston's propeller pumps, designed to move large volumes of liquids for many applications. Large cutaway shows construction and operation. Gives selection information. Complete dimensions, above and below base discharge, are tabulated and illustrated with diagrams. Johnston Pump Co.



### 527-End Suction Centrifugal Pumps

Bulletin 108 describes the new high efficiency, low horsepower Aurora Type GB close-coupled, end-suction centrifugal pumps. Cutaway shows construction and operation. Typical applications given. Selection chart simplifies specification. Dimensions chart gives interesting the control of the c fication. Dimension chart gives sizes for various pumps. Schematic and parts list. Aurora Pump Division.



### 522—Packaged Gas Compressors

White Diesel's new line of medium speed, heavy duty gas compressors, matched with its Superior gas engines, are described in Bulletin 124. Of balanced-opposed design, line contains 2, 4 and 6 cylinder models, ruggedly built for the 200-1000 bhp range.

White Diesel Engine Div., White Motor Co.



### **528—Compressor Drive Turbines**

Bulletin 4850-B1 illustrates and describes Worthington's high-speed compressor drive turbines. Details all component parts including bearings, double flow design, solid rotors, and cam-operated automatic valves. Schematics show automatically controlled gland seal system and speed governing system. Worthington Corp.

### PUMPS & COMPRESSORS continued



#### 529—Rotary Positive Blowers

Bulletin S-32A describes how a rotary positive displacement blower delivers a metered amount of air against varying pressures with a minimum amount of friction. Design features and operating principles are discussed, as well as dimensional and performance data for vertical and horizontal models.

Sutorbilt Corp., Subsidiary of Fuller Co.



#### 535—Pressure Rotary Pumps

Catalog F-4175 gives engineering, construction, performance data on Series F line of pressure rotary pumps. Photographs, dimension drawings of six models, plus bedplate and flange-mounted units, are provided, along with descriptions, drawings of seals and relief valve. Installations are also shown.

Roper Hydraulics, Inc.



#### 530—Ejector Pumps

Catalog describes Piqua's complete line of ejector pumps offered in 6 models with either 2" or 3" discharge. Data on application, construction, and installation included. Contains design and construction features. Specifications for stock models tabulated. Pump capacity curves are given. Cutaway shown.

Piqua Machine & Manufacturing Co.



#### 536-End Suction Pumps

Bulletin 1420 describes a complete line of end suction pumps for liquid transfer and widely diversified pumping services. Optional cast iron bases, with flexible vibration dampeners and vibration isolators. Capacities to 700 gpm, head to 400 feet. Cutaways show construction and operation. Features described.

Pacific Pumping Co.



#### 531—Propeller and Mixed-Flow Pumps

Bulletin 1400, completely new, describes Layne & Bowler Pump Company's Verti-Line propeller and mixed-flow pumps. Ideally suited to handle large volumes at low to moderate heads. Cutaway shows major features, operation, and construction of both designs. Drawings show flow. Data on capacity ranges and heads. Layne & Bowler Pump Co.



#### 537—Submersible Pumps

Bulletin 1050 describes Johnston's submersible pumps, the economical and efficient way of pumping from deep wells, rivers, and sumps. Exploded view shows construction and components. Applications detailed. Data tabulated gives well size, maximum motor hp, capacity in gpm, and construction materials.

Johnston Pump Co.



### 532—Split Case Pumps

Bulletin 105-V gives specifications and features of the Type OJV vertical mounted split case pumps designed for use where space requirements are critical. Beneficial features of horizontal split case retained with substantially reduced space for same capacity and head requirements.

Aurora Pump Div., N. Y. Air Brake Co.



### 538—Pump Selection Data

"When You Buy Your Pump" is a useful guide to the selection of pumps for water supply or booster service in industry, commercial buildings, and municipal water works. Factors to consider in selecting any pump are identified, and various types of pumps are compared. Also included is a selection checklist. Sumo Pumps, Inc.



### 533—Helical Gear Driven Pumps

Bulletin SP-534 describes the enlarged line of heavy-duty helical gear driven pumps. Capacity range is now available from 15 to 450 gpm and with size "C" reducers capable of transmitting up to 40 hp at 520 pump rpm. Independently mounted. Illustrations, dimensions, specifications and capacity tables.

Viking Pump Co.



#### 39\_Fngines

Power Engine bulletin 4312-B1 describes Worthington's SDR oil diesel, dual fuel diesel and spark ignition gas engine. Bulletin includes a fuel cost chart and a rating chart for 5, 6, 7 and 8 cylinder machines. Completely explains construction of the SDR's dependable, reliable components. Installations illustrated. Worthington Corp.



### 534—Submersible Propeller Pumps

Bulletin 2000 is one of the first of its type which describes the unique adaption of the propeller pump to submersible applications. The design has economical advantages when moving great amounts of water for irrigation, dewatering projects, and water supply. Capacities from 500 gpm to 50,000 gpm.

Pleuger Pump Manufacturing Co.



#### 540—Centrifugal Compressors

Bulletin M220.05-S describes York's Series T Turbomaster, a heavy duty single stage centrifugal compressor. Specifications are completely detailed and include, housing, rotor, bearings, lubrication system, shaft seal, capacity reduction, transmission, control panel, and others. Dimensions charted.

York Corp.

### **PUMPS & COMPRESSORS** continued



#### 541—Hermetically Sealed Pumps

Advance Bulletin 977 introduces new line of hermetically-sealed pumps developed for the safe, leak-proof handling of toxic and volatile liquids. Features include cast iron casings, bronze impellers, stainless steel wetted parts, and unique self-adjusting bearing. Thirteen sizes—1" to 5" discharges. Buffalo Forge Co.



#### 544-End Suction Pumps

Bulletin 200 describes in detail the full line of Weinman Types ACB and AEB framemounted end suction pumps for general service pumping, pressure boosting, and hot or chilled water circulation. The bulletin also features a complete pump selection table as well as dimensions and engineers' specifications. Weinman Pump Manufacturing Co.



#### 542—Jet Water Pumps

Bulletin P. P. 360-B describes Mc-Donald's full line of jet water pumps, multi-stage pumps and reciprocating pumps. Section details how to select the best water system for you and includes a chart of quantity use. Description of various models includes specifications. All pumps are illustrated.

A. Y. McDonald Mfg. Co.



#### 545—Rotary Compressors

Inherent advantages of rotary compressors for such applications as shop air, drilling, and gas handling are described in four-page bulletin 16B8244. Construction and operational details, dimensions, and ratings of two-stage, sliding vane compressors for 250 to 1800 cfm at pressures from 60 to 125 psig.

Allis-Chalmers.



### 543-Pump Motors

Bulletin F-2027 contains a collection of technical articles on the maintenance of turbine pump motors, protective devices, lubricants, sound controls, pumping stations, and steps in submersible pump installation. Technical articles, prepared by engineering department of U. S. Motors, appeared in "Underground Raindrops." U. S. Electrical Motors Inc.



### 546—Pumps for Abrasives and Acids

Seven new bulletins are available covering Denver SRL pumps ranging in size from 1½" x 1" to 12" x 10". Denver SRL pumps are rubber lined and are designed to handle sands, abrasives, and acids. Bulletins incorporate specifications, capacities, power requirements, and dimensions for pump layouts. Denver Equipment Co.

# STRUCTURAL MATERIALS & EQUIPMENT



#### 547—Soil Compaction

Foundations on sand are described in booklet "Soil Compaction by Vibroflotation". Contents cover application and operation, soil consolidation examples, data on specifications, excavations and test pits. Detailed drawings show Vibroflot machine in operation and typical compaction pattern for required density. Vibroflotation Foundation Co.



### 549—Wire Rope Catalog

A complete basic catalog for selecting wire rope for any use. Cross sections of different types of rope show construction. Rope diameters, breaking strength, and weight are given for all classifications. Well illustrated showing different uses. Wire rope fittings are illustrated.

American Steel & Wire Division, United States Steel Corp.



### 548—Precast Panel Seals and Gaskets

Bulletin SG-662 describes seals and gaskets especially developed for control joints and for use with precast concrete wall panels. Types designed to seal both vertical and horizontal joints under virtually any condition that might arise in either precast concrete or prefabricated metal panel construction.

Williams Seals and Gaskets Division.



#### 550—Special Purpose Steel

Catalog C-949 illustrates and fully describes Roebling high carbon steel, low carbon steel, and special purpose steel. Chemical composition, mechanical properties, finishes, and applications. Tabular data includes weights, hardness conversions, equivalents, gauges tolerances.

John A. Roebling's Sons Division Colorado Fuel and Iron Corp.



#### 551—Heavy-Weld Steel Grating

New 8 page catalog H760 has a unique series of charts for use in determining the exact size and type of *Heavy-Weld* grating suitable for your particular application. Handy tables simplify the problem of specifying exactly the right grating for every load requirement.

Rockwell-Standard Corp., Grating Division.



#### 557—Concrete Anchors

Bulletin F306P describes Phillips Jetlok anchors for predrilled holes. Cutaway shows construction. Installation pro-cedures are explained and pictured. Complete specifications are given. Tabulated information consists of catalog number, bolt size, drilled diameter, thread depth, and drilled depth.

Phillips Drill Co.



### 552—Skylights, Spires, and Steeples

Bulletin issued by Overly Manufacturing Company discusses roofing, skylights, coping, spires, and steeples. Cutaways and engineering drawings show construction. Specifications include quality standards, materials, finish, shop drawings, and erection or installation. Area sales representatives listed.

Overly Manufacturing Co.



#### 558-Air Curtain Door

Specification sheet gives complete information on Jamison's Air Isolator for moderate temperatures. Permits traffic to move continuously through open doors. Photograph show installation and diagram shows flow of air curtain. Horizontal and martial zontal and vertical sections shown in drawings with dimensional information. Jamison Cold Storage Door Co.



### 553-Pipe Joint Compound

Bulletin describes Saueresisen No. 52 pipe joint compound which insures a leak proof joint. Advantages are outlined. Photographs show application procedures. Also describes Sauereisen No. 51 graphite paste, an oil resistant lubricant. Application procedures are illustrated. Typical applications pictured.

Sauereisen Cements Co.



#### 559-Grating and Treads

General grating catalog F-400 contains illustrations, descriptions, and complete engineering data on grating flooring, treads, and floor armoring (riveted, press-locked, and welded types). Irving grating is safe, durable, fireproof, ventilating, clean, economical industrial and power plant flooring and stairways. Irving Subway Grating Co., Inc.



### 554—Metal Rolling Doors

Bulletin 104, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings, mounting methods for various applications and locations; specifications; and explains special construction features of these doors. Kinnear Manufacturing Co.



#### 560-Metallic Floor Hardener

Bulletin describes Ferro-Fax the metallic floor hardener for producing long lasting, wear resistant concrete floors. Plain or colored and nonsparking. Photographs show step-by-step application procedures. Use, specifications, colors, packing, and shipping weights.

A. C. Horn Companies
Division of Sun Chemical Corp.



#### 555-Steel Roof Systems

A completely new manual, Catalog 248 describes Inland's ten separate roof sys-tems which offer the designer a choice of steel or poured construction. Included are comparision and selection charts, details, load tables, section properties, methods, specifications and other data on Inland roof systems. Inland Steel Products Co.

### 561—Steel Welding Equipment

The consulting engineer's file folder contains literature describing the use of Nelson stud welding equipment for concrete anchoring devices and other structural fasteners. Includes data on welded stud fasteners, concrete fasteners, and powder actuated fasteners. Illustrated. Nelson Stud Welding Division,

Gregory Industries, Inc.



### 556—Cable, Wiring, Tubing Supports

Two systems of support for all types of cable, wiring, and tubing are described in a 28-page illustrated catalog. Systems are engineered to be used interchangeably, depending on the weight of the ably, depending on the weaght of the load to be supported at any location. Globetray, the ladder-type tray, and Cable-strut, the basket-type, described. Globe Co.



#### 562—Steel Base for Concrete Floors

Bulletin BFg-604 describes Granco Steel's Corruform and Tufcor, steel base for concrete floors. Line drawings show construction. Installation steps are pictured. Selection tables for safe superimposed loads, maximum allowable loads, pipe tunnels, and physical properties. Typical specifications and details are included. Granco Steel Products Co.



#### 563—Heavy Construction Fasteners

Bulletin 160 covers large fasteners for the heavy construction and machinery industries. Large forged standard and special purpose nuts, bolts, threaded rods, loop rods, eye bars, construction accessories, size 1% in. thru 12 in. bolt diameter. Illustrated with photographs of standard and special large fasteners. Jos. Dyson & Sons, Inc.



### 569—Masonry Wall Reinforcement

Bulletin by Dur-O-wal describes wall reinforcement and Rapid Control Joints. Includes advantages, description, physical properties, section table, and general specifications for solid masonry wall construction. Line drawings show application. Drawings and specifications on both types of Rapid Control Joints. Dur-O-waL.



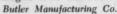
#### 564—Cable Support Systems

Catalog 106 describes Chalfant cable support systems. Line drawing illustrates how system is installed. Method of fastening pictured. Complete specifications, design information, and dimensions for Cabletrays, Cableracks, Cabletroughs, and Cabletruss. Complete details are included on accessories and fittings. Chalfant Products Co.



#### 570-Pre-engineered Metal Buildings

Color booklet 2023 describes a new and unique pre-engineered metal building for storage and handling of bulk commodi-ties, Building is self-cleaning — with horizontally-corrugated sidewalls replacing normal interior girts. Available in widths from 40 to 100' and sidewall heights of 15 and 24'.





#### 565-Self-Lubricating Bushing Manual

Manual 56 gives complete information, technical data, and specifications on Lubrite self-lubricating bushings, bearings, and washers for industrial equipment, hydro-electric, high temperature missile, and atomic applications. Design specifications include loads and speeds, data on alloys, and clearance tables. Merriman Bros., Inc., Lubrite Division.



#### 571—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given.





### 566-Masonry Reinforcements

AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new 1961 Sweet's brochure is now available. This new brochure features design drawings, photographs of actual installa-tions, and suggested guide specifications. Line drawings show various applications. AA Wire Products Co.



#### **572—Precast Concrete Elements**

Catalog HMM 2180 graphically describes the unusual custom design possibilities of Marietta's complete line of precast and prestressed concrete building elements. Information on application for large or small all-concrete industrial and commercial buildings.

Marietta Concrete Division American-Marietta Co.



### 567—Safe, Slip-Proof Surfaces

This bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Included are methods of application. These anti-slip abrasives can also be used with epoxy resins to cover existing surfaces. Exolon Co



### 573—Steel Decks for Roofs

Bulletin D-61 describes Mahon steel deck for roofs, sidewalls, partitions, ceilings, and a base for concrete floors. Includes cross-section drawings, cutaway, and actual installation photographs. Engineering data includes section property tables, load tables, and complete construction details. R. C. Mahon Co.



Tread-Grip steel stair treads combine strength of construction with safe, nonslip footing, according to four-page bul-letin HTP2130. This brochure describes such features as A. W. Algrip nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions.

Horace T. Potts Co.

#### 574—Steel Stair Treads



#### 568—Glass Protected Smokestacks

Bulletin SS-210 describes A. O. Smith's glass coated smokestacks, toughest protection against corrosion. Graphs show comparison of costs against unlined stacks over period of years. Complete specifications. Tables of sizes and shipping weights. Assembly details. Diagrams show special sections.

A. O. Smith Corp.



#### 575—Efficiency Waterstops

Bulletin No. W-61 describes Williams efficiency waterstops for use in building and public works. Protects bridge and highway applications. Diagrams show application details. Also describes new molded union and junction fittings for use with Williams rubber and neoprene waterstops. Sales representatives listed. Williams Seals & Gaskets Division,



#### 581-Steel Structural Shapes

Publication ADUCO 27016-61 deals with the new structural shapes, the steels of which they are made, and their most economical uses. Charts, graph, and examples show methods of steel selection and use which results in the most economical structure. Weight and cost savings are shown.

United States Steel Corp.



#### 576-Electro-Temp Cements

Bulletin describes Sauereisen Electrotemp cements, which have a zirconmagnesium oxide base. These cements have extremely high insulating value and will not injure the finest resistance wire. Includes such information as uses, application instruction, and electrical values.

Sauereisen Cements Co.



#### 582—Custom Steel Products

Catalog D-933 describes the diversified products and varied engineering services and facilities available from Roebling. Ideas are presented in a direct manner with details held to a minimum showing that Roebling is well-equipped to handle special problems.

John A. Roebling's Sons Division Colorado Fuel and Iron Corp.



#### 577-Aluminum Grating

New six-page illustrated bulletin describes the basic advantages of Gary super Galok aluminum grating. Outlines its industrial uses for stair treads and other uses, decorative and functional. Included are easy-to-use tables of safe loads and weights, panel widths, types. Rockwell-Standard Corp.,

Grating Division.



#### 583-Self Drilling Concrete Anchors

Bulletin F-200 describes Phillips Red Head self-drilling concrete anchor, the original self-drilling system. Pull-out and shear loads tabulated in pounds. Installation procedures outlined and illustrated. Prices are given. Various types of anchors pictured. Specifications are charted. Accessories described.

Phillips Drill Co.



#### 578—Metal Doors and Frames

Bulletin issued by Overly gives data on labeled doors and frames, hollow metal door frames, kalamein doors, tin clad fire doors, stainless steel and colorclad steel entrances, and others. Contains engineering details and door designs in diagrams. Complete specifications and installation photographs.

Overly Manufacturing Co.



#### 584—Rolling Counter Shutters

Bulletin 107 describes the Kinnear rolling counter shutters with midget slats. These metal shutters provide protection against weather, pilfering, or illegal entrance. Section views and diagrams show complete details and dimensional data. Manual or crank operated. Custom built to fit any opening.

Kinnear Mfg. Co.



### 579—Noise Deadening Doors

Bulletin SR22-61 describes Jamison doors engineered to solve noise problems at any sound level. Explains how 50 db doors give maximum sound reduction. Engineering details on Jamison single and double doors show all elevations. Specifications are included. Typical installations are listed.

Jamison Cold Storage Door Co.



#### 585-Floor Deck

Catalog 272 describes Inland Steel's new Ht-Bond floor deck, offering concrete reinforcing without bars. Tables of section properties and allowable superimposed loads. Complete construction details are included. Suggested engineers specifications include scope, material, design, and erection. Sales locations. Inland Steel Products Co.



### 580-Multi-Purpose Admix

Bulletin 2400 describes Horn's No-Freeze Multi-Purpose Admix providing winter protection for concrete and mortar. Covers the advantages, quantities to use for various temperature ranges, what it does, laboratory reports, application, packaging, and shipping weights.

A. C. Horn Companies
Division of Sun Chemical Corp.



#### 586—Composite Building Construction

Bulletin describes composite construction. This is simply an improvement of the commonly used concrete slab and steel beam type construction. Gives history, advantages, compares new and old construction, records project saving 20 to 25 percent in structural steel.

Nelson Stud Welding Division, Gregory Industries, Inc.



#### 587-Fly Ash Hopper Liner Grid

Brochure containing illustrations, drawings, data, and description of how the life of cement linings in fly ash hoppers, induced draft fans, cat crackers, reactors, and the like can now be lengthened by "Gridsteel". Installation procedure outlined. Photographs show many varied

Irving Subway Grating Co., Inc.



### 593-Curved Steel Sheet

Bulletin D-611 describes Granco's Arch-Cor, a deep corrugated, galvanized, curved steel sheet offering a new concept in arch construction. Applications described and illustrated. Physical properties, data on arches, suggested details, structural considerations, and graphs on horizontal thrust and are length.

Granco Steel Products Co.



#### 588-Large Fasteners, Accessories

Bulletin 1260, an engineering guide for selecting large fasteners and construction accessories, lists complete specifications for threaded rods, clevises, turnbuckles, coupling nuts, and sleeve nuts. Guide also describes typical applications of special fasteners. Bolt diameters are 1% in. and up.

Jos. Dyson & Sons, Inc.



#### 594—Continuous Metal Ties Report

Armour Research Foundation of Illinois Institute of Technology summary report on "Investigation of Continuous Metal Ties as a Replacement For Brick Ties In Masonry Walls." Gives relative merits of the brick header course vs. continuous wire reinforcement in tying two wythes of a brick and block masonry wall.

Dur-O-waL.



### 589—Cable and Tubing Support System

Chalfant Support system utilized for carrying instrumentation tubing, process tubing, piping, and control cables. Recommended for more economical, and faster installation over previous type systems. Completely pre-engineered and available with all accessories. Aluminum, galvanized steel and aluminized steel. Chalfant Products Co.



#### 595-Metal Buildings

Booklet 2048 describes and illustrates the complete, redesigned line of Butler metal buildings. Describes structural frames, three distinctive types of wall systems, wide range of color sections. Liberally illustrated in full color with newest buildings for commerce, industry and community.

Butler Manufacturing Co.



### 590-Complete Structural Systems

Bulletin describes Stran-Steel's complete lightweight steel system with fully integrated cold formed structural sections. Contains information on joists, studs, channels, columns, beams, rigid frames, zee sections roof deck, ribbed decking, and curtain wall. Includes patterns, dimensions, and properties.

Stran-Steel Corp.



### 596—Sprayed Asbestos

Sprayed Limpet asbestos for fire protection, and acoustical and moisture control, is described in detail in a 4-page folder. The folder provides a list of approved fire-resistance ratings for the product, and lists complete specifications. Pictured are buildings in which this product is used.

Keasbey & Mattison Co.



#### 591—Sealant for Curtain Walls

Brochure 13-101 describes Dow Corning 780, a one-part rubbery sealant for curtain walls and other building construction. Material is applied as received, will not stain masonry, does not slump, and can be applied at any temperature from 0°F to 100°F. The sealant has superior weather resistance.

Dow Corning Corp.



#### 597—Steel Buildings

Bulletin 12360 describes various types and sizes of Armco pre-engineered steel buildings. Specifications for truss-type, rigid frame, self-framing, and single slope roof, include roof pitch, structural system column reacting unall contents. system, column spacing, wall covering, roof covering, and foundation. Drawings show close detail, and elevation.

Armco Drainage & Metal Products, Inc.



### 592—Pressure Grouting Services

Brochure PGS-0002 describes Halliburton Pressure Grouting Services, including equipment, personnel, and materials for any size grouting job - a dependable and convenient method of metering, mixing, placing grouting materials continuously. Selection of special chemical grouting fluids and cement grout slurries. Halliburton Co.



### 598—Concrete Buildings

Enumerates economic advantages of monolithic concrete buildings, including comparisons of actual bid prices on comparisons of actual big prices of competitive materials for a number of major projects. Examples of design flexibility and the achievement of struc-tural beauty and functional require-ments with the greatest economy.

Concrete Reinforcing Steel Institute



#### 599-Metal Buildings

Booklet 2040 describes the basic, quality construction features of Butler metal buildings. Outlines six structural systems, three wall panel systems (Butlerib, Monopanel, Modular), and panel fasteners. Roof system described and illustrated with photographs. Show details of Butler's distinctive trim.

Butler Manufacturing Co.



#### 603-Floor Grating

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J. Borden Metal Products Co.



#### 600-Open Web Steel Joists

New 12-page bulletin describes Laclede high-strength open web steel joists, "J", "H" and "LA" Series. Includes numerous photographs and drawings, plus detailed information on design and construction features, dimensions and specifications. Booklet has all data for specifying erection steel.

Laclede Steel Co.



#### 604—Masonry Reinforcing Tie System

Report No. 60-1 by the Building Officials Conference of America, Inc. gives approval of that body to the Econo-Lok reinforcing tie system for masonry wall construction. Includes application and supporting data; description and use of product. Gives complete results of structural tests and recommendations. AA Wire Products Co.



#### **601**—Commercial Glass Properties

Bulletin 83 is a reference guide to the properties of over 32 selected commercial glasses. Contains 16 pages of text, tables and graphs giving an authoritative discussion of glass, its optical qualities, corrosion resistance, electrical properties, heat transmission, mechanical properties, and other properties.

Corning Glass Works.



#### 605—Safety Grating

Catalog 5911 describes Globe's Grip-Strut safety grating available in steel, aluminum, and stainless steel. Complete information includes features, advantages, types of loading, load charts, material specifications, stair treads, installations, and special applications, Contains data on Golden Nugget welded grating. Globe Co.



#### 602-Aluminum Grating

Bulletin KA-160 describes a new kind of aluminum grating. New process permanently locks bars. No rivets, bolts, or screws. Contains illustrations and complete engineering data on grating and treads. Includes table of safe loads, weights and types, and panel width in inches. Three types of tread nosing. Kerrigan Iron Works Co.



### 606-Jointing Flexible Gaskets

Technical brochure describes and illustrates the use of "Tylox C" and "C-P" sewer pipe jointing flexible gaskets. Gaskets are for single or double offset pipe of all sizes. Diagrams show gaskets properly positioned and under full compression. Photographs show installation procedures. Coupling diagramed.

Hamilton Kent Manufacturing Co.

## WASTE DISPOSAL EQUIPMENT



#### **607—Sewage Treatment Plants**

Bulletin 19-S-94 describes Walker's new Sparjair process utilizing contact stabilization and aerobic wet burning. Operation fully described, accompanied by diagram showing arrangement of components. Complete detail drawings show Sparjair plants. Complete specifications in tables. Engineers' specification form. Walker Process Equipment Inc.



### 608—Sewage Lift Stations

Bulletin EJ-60 describes the Ellipto-Ject packaged pneumatic sewage lift station manufactured by Tex-Vit Manufacturing Company. A simplex unit available in 20 to 200 gpm, it features exclusive shell-within-shell design. Bulletin provides engineering data, specifications, and dimensional drawings.

Tex-Vit Manufacturing Co.

#### WASTE DISPOSAL EQUIPMENT continued



### 609—Packaged Sewage Pump Stations

A new 8-page bulletin contains a descriptive and well illustrated story of the Tex-Quad rectangular-shaped packaged pump station. Operating features, design improvements, dimensional drawings, and a list of variable capacity pump benefits are incorporated in the brochure. The company's other products are listed. Tex-Vit Manufacturing Co.



#### 613—Waste Water Purification

Bulletin ADC 17-1009-761, illustrates a simplified method for maintaining permissible pH on waste waters from chemical and processing plants. Bulletin shows flow diagram of the ion-exchange system and table showing volume of resin to concentration of acid or alkali required. Chemistry of neutralization. Cochrane Division, Crane Co.



#### 610—Treatment Tanks

Bulletin AET-59 contains full-color illustrations of water and effluent treatment tanks. They are steel-reinforced concrete structures faced on both sides with vitrified tile, laid with corrosion-resistant mortar. Tanks are exceptionally attractive in appearance. Included are drawings showing wall construction.

Stebbins Engineering & Mfg. Co.



### 614—Municipal Engines

Bulletin SA-631 describes Climax engines which provide low cost, dependable power for sewage and water treatment plants. Engine specifications for various models are given in tabular form, Photographs of models are accompanied by power curve graphs. Standard equipment and optional equipment. Climax Engine Mfg. Co.



### 611—Adjustable Speed Sewage Pump

Bulletin 4400-PRD-270, describing adjustable speed sewage pumping using the Ampli-Speed Magnetic Drive, has been made available by Electric Machinery Mfg. Co. Explains how a magnetic drive works, the economics of adjustable speed pumping, consulting engineer's role in sewage construction.

Electric Machinery Mfg. Co.



#### 615—Degrators

Bulletin 7320 presents 4 activated sludge developments: D-O Inka aeration for lowest installation and operating costs; D-O aerator for highest O, absorption in new or existing tanks; RSR clarifier to minimize sludge detention time; Spirocortex System, combining Biofiltration simplicity with sludge efficiency. Dorr-Oliver Inc.



### 612-Waste Disposal Units

Bulletin 7330 gives specifications and installation data on new compact STP for housing developments, industrial plants and the light construction industry. Six sizes provide for maximum flows from 15,000 to 180,000 gpd. Incorporates single or dual clarification, Biofiltration, digestion and chlorination, Dorr-Oliver Inc.



### 616—Waste Treatment Equipment

Bulletin G-50 describes Walker's complete line of water, waste, and sewage treatment equipment. Contains text giving engineering data on various pieces of equipment accompanied by photographs, diagrams, graphs, and charts. Cutaways show flow. Many pictures illustrate typical installations.

Walker Process Equipment Inc.

# WATER TREATMENT EQUIPMENT



#### 617—Precipitator

Bulletin 4836 describes Permutit's new Type M precipitator, a uniquely simplified solids-contact-type sludge blanket clarifier. Diagram shows construction, operation, and flow. Operation and construction explained in detail. Complete dimensional data. Recommended specifications. Sales offices, representatives. Piaudler Permutit Inc.



### 618—High-Flow-Rate Clarifiers

Bulletin CL-158 describes the *Illco-Way* continuous high-flow-rate clarifier, an up-flow coagulator design that is adaptable to a wide variety of water and waste treatment applications, including lime-soda dealkalization, removal of iron, color, turbidity, organics, silica, and chemical waste treatment.

Illinois Water Treatment Co.

### WATER TREATMENT EQUIPMENT continued



#### 619-lon Exchanger

Technical bulletin explains principles and chemical reactions of ion exchange in simple, understandable terms. Describes and shows flow-diagrams of eight typical multi-column deionizers. Gives details about mixed-bed type Ultra-De-Ionizer giving water of highest chemical purity. Deionizer selection chart. Elgin Softener Corporation.



#### 625-Filter Plants

Filter plants for the removal of iron, manganese, taste, odor, and gas are described in a new General Filter bulletin. Various problems are listed and answers given. Four basic treatment methods are described and graphically shown in drawings. Actual installations in all parts of the country are shown. General Filter Co.



#### 620-Water Treatment Equipment

Bulletin 615 is a booklet on water treating equipment describing manual and automatic zeolite softeners, mixed-bed and multi-column deionizers, dealkalizers, ion exchangers, filters, purifiers, aerators, and degasitors. Also covers spray and tray type deaerating heaters and water treating chemicals. Elgin Sojtener Corp.



#### 626-Upflow Clarifiers

In bulletin 5811 models C, CP, CPS, P and CF of General Filter Company's upflow clarifiers are described and illustrated. Flow charts and important features, essential to economical and efficient operations, are included. Typical contraflo industrial, utility, and municipal installations are shown and described. General Filter Co.



#### 621—Cartridge De-Ionizers

Operating on the same principle as large mixed-bed de-ionizers used in power plants and for process water supplies, these cartridge de-ionizers are designed to furnish small quantities of purified water for laboratories and pilot plant applications. Cartridges and stallations illustrated. Prices are included. Illinois Water Treatment Co.



#### 627—Dearating Heater

Bulletin WC-126 contains full specifications on simple, compact Graver "LSC" deaerating heater, featuring low initial cost, guaranteed performance, ease of installation, minimum space require-ments. Complete with all accessories, the "LSC" comes in wide range of sizes, ready to run. Complete details. Graver Water Conditioning Co.



#### **622**—Brinemakers

Bulletin B160A describes Morton's Model E Series brinemakers using the exclusive Morton Fluitron. Function, performance data, installation procedures, and operating instructions are included in this bulletin. Line drawing shows construction and operation. Component parts shown and named. Product photographs. Morton Salt Co.



#### 628—Automatic Gravity Filter

Bulletin WC-130 describes construction, operation and applications of the Graver Monovalve filter, fully automatic gravity filter that stores its own backwash water, requires little maintenance or attention. Backwash is initiated automatically by head loss across filter beds. Bulletin provides flow diagrams, dimensions. Graver Water Conditioning Co.



#### 623-Leveltrol System

624-Recarbonator

Bulletin B659P describes a system for wet storage brinemaking which proportionately replaces water as brine is withdrawn. Permits accurate salt inventory; prevents overflow loss; eliminates corrosion of moving parts. Line drawings show different types of assemblies for different brine-use systems. Morton Salt Co.

Bulletin 1310 describes the Type P Recarbonator and discusses the princi-ple of recarbonation of lime softened

waters. Requirements of an effective system are listed. Operation is described

and diagramed. Includes capacity charts

and basin dimensions. Schematics, various elevations, shown. Graphs, specifications.

#### 629-Water Works Brass Goods

The water works brass goods bulletin W-500 illustrates and describes Mc-Donald water service products. Included are curb stops, corporation stops, goosenecks, meter stops and couplings, service pipe couplings, and extension service boxes. Each product offered is pictured with description and specifications.



### A. Y. McDonald Mfg. Co.



### 630-Water Treatment System

Bulletin AH-510 shows the latest arrangement of Hardinge Unitized water treatment system, using common-wall construction and including all the es-sential elements for flocculation, sedi-mentation, rapid sand filtration, and storage. Cutaway wash drawing shows arrangement, details and operation. Hardinge Co., Inc.



### WATER TREATMENT EQUIPMENT continued



### 631—Complete Water Services

Bulletin 10 outlines the complete water services offered by Layne & Bowler. Gives general facts and pertinent information on water well systems, drilling, and allied water services. Included are data on equipment for municipalities, industry, and agriculture. Lists pumps for every application. Associates listed. Layne & Bowler, Inc.



#### 632—Ion Exchanger

Bulletin 4840 gives complete information on Permutit's Q Cation exchange resin and Ion exchanger. Gives physical characteristics of Permutit Q, a sulfonated polystyrene cation resin. Operating characteristics of sodium cycle and hydrogen cycle are accompanied by charts and graphs. Sales offices and representatives. Pfaudler Permutit Inc.

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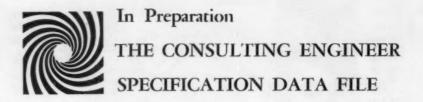
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| Vibroflotation Foundation Co. Viking Pump Co. Vogt Machine Co., Henry  Wakefield Co. Walker Process Equipment, Inc. Ward Leonard Electric Co. Water Saver Faucet Co. Waukesha Motor Co. Webster Engineering Co. Weighing & Controls, Inc. Weil-McLain Co. Weinman Pump Mfg. Co. Westinghouse Electric Corp5, 203, 219, 228, 335, 343, White Discel Engine Div.   | 336,<br>607,<br>269,<br>173,<br>479,<br>267,<br>221,<br>490,<br>212,<br>134,<br>354,   | 533<br>486<br>370<br>616<br>305<br>449<br>492<br>489<br>301<br>491<br>544<br>227<br>146,<br>366  |
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| Vibroflotation Foundation Co. Viking Pump Co. Vogt Machine Co., Henry  Wakefield Co. Walker Process Equipment, Inc. Ward Leonard Electric Co. Water Saver Faucet Co. Webster Engineering Co. Weighing & Controls, Inc. Weil-McLain Co. Weinman Pump Mfg. Co. Western Engineering & Mfg. Co. Westinghouse Electric Corp5, 203, 219, 228, 335, 343, White Diesel Engine Div., White Motor Co. Whiting Corp. Whiting Corp. Wickes Boiler Co. Wiley & Sons, Inc., John Williams Equipment & Supply Co. W.K-M Div. of ACF Industries Inc. Wood Co., R. D. Worthington Corp.   | 517,<br>474,<br>336,<br>607,<br>269,<br>173,<br>479,<br>267,<br>221,<br>490,<br>212,<br>354,<br>485,<br>484,<br>548,<br>421,<br>184,<br>528, | 533<br>486<br>370<br>616<br>305<br>449<br>492<br>489<br>301<br>544<br>227<br>146,<br>366<br>522<br>371<br>389<br>506<br>181<br>575<br>445<br>452<br>539                            |
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